



Government of Western Australia
State Emergency Management Committee

EMERGENCY PREPAREDNESS REPORT 2019

Cover photo – Spring in the Hills, Perth – Steve Kerrison

Page 7 – Sunset at Luck Bay, Cape Le Grande National Park, Esperance – Antony Spencer

Page 11 – China Wall, Halls Creek – Grant Wilson

Page 15 – The Pinnacles, Nambung National Park, Cervantes – Tourism Western Australia

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Page 29 – Northshore SES Unit, Vincent Fire Station open day – Department of Fire and Emergency Services

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ACRONYMS

AVL	Automatic vehicle location	IAP	Intelligent Access Program
BCoE	Bushfire Centre of Excellence	ISG	Incident Support Group
BOM	Bureau of Meteorology	LG	Local Government
CaLD	Cultural and linguistically diverse	LMRG	Lessons Management Reference Group
CHRMAP	Coastal hazard risk management and adaptation planning	LPG	Liquid petroleum gas
DFES	Department of Fire and Emergency Services	NDRP	Natural Disaster Resilience Program
DMIRS	Department of Mines, Industry Regulation and Safety	NDRRA	Natural Disaster Relief and Recovery Arrangements
DPIRD	Department of Primary Industries and Regional Development	NSDR	National Strategy for Disaster Resilience
DRE	Disaster resilience education	OASG	Operational Area Support Group
DWER	Department of Water and Environmental Regulation	SECG	State Emergency Coordination Group
EM	Emergency management	SEMC	State Emergency Management Committee
ESP	Essential Service Provider	SHP	State Hazard Plans
FMD	Foot-and-mouth disease	SPP	State Planning Policy
HAZMAT	Hazardous materials	SSAN	Security sensitive ammonium nitrate
HMA	Hazard Management Agency	TPP	Tomato-potato psyllid
HTVTS	HAZMAT Transport Vehicle Tracking System	UN	United Nations
HW	Heatwave	WA	Western Australia
		WALGA	Western Australian Local Government Association

FOREWORD



Dr Ron F Edwards
Chair – State Emergency Management Committee

The *2019 Emergency Preparedness Report* represents a turning point for our annual reporting on preparedness for large-scale emergencies in Western Australia (WA). Since the first report in 2012, we have focused on the risks we face and the capabilities that are in place to combat them, refining our responses with each iteration.

The result has been a series of detailed annual assessments that have guided and informed state and agency level investment and allowed for the development of readiness and resilience plans.

Over this period, considerable advancements have been made in the overall understanding of the hazards we face and – just as importantly – in interagency cooperation and collegiality. The emphasis is on continuous improvement from a committed and motivated sector.

And in times like these with COVID-19 stretching us at every turn, this emergency management (EM) capability comes to the fore. COVID-19 has shown us as a state and as a nation the wide-reaching impacts that hazards can deliver. Now more than ever there is the need to invest in EM capability and interoperability so that we can work together to combat the threats that we will inevitably face.

EM is complex. As we said in 2016: “All the pieces need to fit together smoothly and efficiently and – more importantly – they must do so in times of crisis.”

Fortunately, in recent times prior to COVID-19, EM has been evolving in a period of relative calm. Except for the 2016 Waroona/Yarloop bushfire, no major incidents have truly tested our readiness. In fact, we do the business as usual events often and well.

Experience has taught us that it is when EM systems and processes are stretched to their limits that true learning occurs. And these are the times we must be prepared for.

The work of the many agencies that make up the EM sector has been outstanding but we recognise now that their reach and influence only goes so far.

What we must do in the future is to fully capture the imagination, attention and focus of those that can most readily effect change – and that is the WA community.

We know that people rally and come together in times of crisis but the question we need to answer now is how we can engage people in planning before a disaster or emergency event occurs.

Unlike previous reports, the *2019 Emergency Preparedness Report* focuses not only on the risks and capabilities that we have but also on the complexities that could arise during emergencies.

The things that tend to hurt us or disrupt us the most in life is the loss of those things that we take for granted. Emergencies tend to deliver just that.

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As the late former Prime Minister Bob Hawke once said: “The things which are most important don’t always scream the loudest.”

While the look and feel of this year’s report has changed, we have maintained the consistency and integrity of the underlying data and processes.

As in past years, we collected and analysed information from across the sector to assess the preparedness of the state.

We continued to identify strengths, weaknesses and gaps in services as well as insights and opportunities for the sector.

This year, the data is delivered in a much more graphical and interactive manner.

In summary, we have changed our approach to delivering the emergency preparedness message this year in the hope of making a bigger impact on the community.

We hope the in-depth exploration of individual emergency scenarios that follow will bring a deeper appreciation of the impact of emergencies on both individuals and communities – and more importantly, serve as a prompt for action.

After all, at its heart, emergency preparedness is about protecting the things that we love and value.



Dr Ron F Edwards

Chair – State Emergency Management Committee
20 June 2020

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CHAPTER 1

EXECUTIVE SUMMARY

01 EXECUTIVE SUMMARY

This year once again delivered a picture of a committed and collaborative EM sector. Agencies and a large group of local governments (LGs) were actively seeking to improve their own performance while working in concert with their partners. The relationships, trust and coordination gained between incidents are often heavily relied upon during emergencies.

For several years now the EM sector has been highlighting that it cannot do it alone, and that its reach and influence can only go so far. The sector recognises that major and catastrophic events cannot be fully managed within existing resources. While surge plans and resource sharing arrangements are in place, gaps do exist.

This year (2019) brought an overall trend of improvement in the capability of the EM sector. Some of the notable findings on capability include:

Alerts and Warnings Quality

Alerts and Warnings Quality was reported as Hazard Management Agencies (HMAs) highest capability. This area reflects the ability of HMAs to deliver high quality and timely advice to the community in times of crisis.

Situational Assessment

Situational Assessment was reported as a relatively high capability across the sector with HMAs, Essential Service Providers (ESPs) and LGs improving between 2018 and 2019. This area includes the ability to assess the nature and extent of a hazard during an emergency, including any vulnerable elements that are at risk, and the resources required to respond.

Impact Assessment

Impact Assessment refers to the capability of agencies to deliver or effectively contribute to the completion of a comprehensive impact assessment. It also incorporates whether these findings are being used to inform recovery coordination, EM planning and prevention/mitigation priorities.

Impact Assessment was the highest reported capability among LGs and ranked highly amongst ESPs.

Recovery Planning and Support

The recovery capability area comprises a range of factors including having plans in place, the skills and resources to execute them and the ability to sustain a recovery effort.

The sub-area Recovery Plans is the second highest capability for LGs. However they note limitations in both their skills and resources to support recovery across the built, social, economic and natural environments.

Infrastructure

ESPs own and operate much of the critical infrastructure across the state, and they reported very high levels of capability for protecting it. They also reported high capability to manage multiple concurrent emergencies with existing infrastructure and equipment. This was an area that may require consideration for both HMAs and LGs in the future.

Essential Services Protection

Essential Services Protection was the greatest area for improvement among HMAs. All reported having plans to protect continuity of their telecommunications and most have plans to protect power supply in the event of an emergency. While this was an area of great improvement it did so from a relatively low baseline indicating that further improvements are available, particularly around plans to ensure continuity of water, sewerage and fuel for their operations.

Essential Services Protection improved for LGs in 2019, particularly in relation to protecting their power supply.

Sector Information Sharing

Sector Information Sharing remains a low ranking capability for both HMAs and ESPs, however improvements did occur in the last year. For HMAs, this was primarily due to improvements in sharing information about vulnerable elements and treatment options. For ESPs, the improvement was as a result of increased sharing with business and industry.

Despite this progress, future areas of improvement for HMAs include sharing of individual risk information with LGs and communities, depending on the nature of the risk.

Sustained Recovery

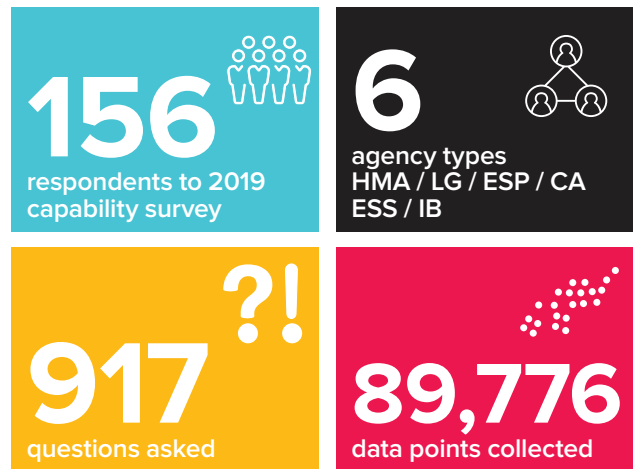
The ability to sustain a long term recovery was the lowest reported capability in both 2018 and 2019. Few LGs reported having sufficient resources to undertake this for 18 months or more.

THE YEAR AT A GLANCE

This year (2019) has seen notable challenges to and considerable advancements in many areas of the EM field. The following is a high level snapshot of some of the key areas.

Capability collection

Capability data was collected for analysis and used in the *2019 Emergency Preparedness Report*.



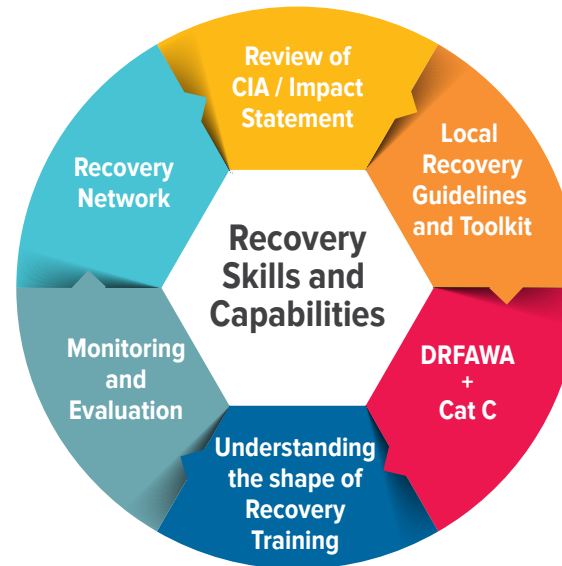
Planning to recover

The concept of planning to recover was first raised in the *2016 Emergency Preparedness Report*. It was found, at that time, that significant work had been done to prepare our response to emergencies but less to plan for our recovery afterwards. Since this time, a considerable amount of attention and effort has been directed towards recovery.

The focus of recent work has been to prepare, in advance, to deliver better outcomes for communities.

Some major advances include:

- creation of the State Recovery Network
- review of critical recovery elements
- recovery training
- local recovery guidelines
- revised impact statements.



Bushfire Centre of Excellence

The State Government is integrating bushfire management activities across the state to maximise bushfire protection. A major component of this has been the establishment of the Bushfire Centre of Excellence (BCoE).

Announced in April 2018, the centre has been designed as a learning hub to support the transfer of bushfire knowledge, training, science and research. It will be accessible to all bushfire management stakeholders.

The construction of the BCoE building outside Pinjarra in the Shire of Murray is due for completion in late 2020.

The work of the centre has already commenced, with functions and a service delivery model already delivering results. More information is available at:

www.dfes.wa.gov.au/bushfirecoe



The announcement of the location of the Bushfire Centre of Excellence in Nambeelup Peel Business Park on 1 March 2019. The Premier, the Hon. Mark McGowan MLA and the Minister for Emergency Services the Hon. Francis Logan MLA



Local Governments

The following represents some statistics on LG reported activity during the year.

1/2 of LGs had an emergency since 2016

10 LGs have had recovery periods of
18 months or more since 2017

55 LGs have or are developing a Bushfire Risk Management Plan

116 hazard scenarios assessed by LGs with support from AWARE

120 risk assessment training workshops conducted for LGs

Disaster Recovery Funding Arrangements WA (DRFAWA)

On 1 November 2018, the Australian Government and the States and Territories commenced working under the new disaster recovery funding arrangements to replace the Natural Disaster Relief and Recovery Arrangements (NDRRA) determination. The new cost-sharing arrangements provide relief for:

- personal hardship and distress assistance, including the engagement of a community recovery officer to work with individuals and families receiving personal hardship and distress assistance
- counter disaster operations
- concessional loans or interest subsidies for small businesses and primary producers
- transport freight subsidies for primary producers
- loans and grants to voluntary non-profit organisations and needy individuals
- the reconstruction of essential public assets
- community recovery funds.¹

The first activation under the new funding arrangements occurred following St Ronan's Bushfire in the Shire of York in January 2019. In the fire, the 6 Mile Brook Bridge near York was damaged beyond repair.

Risk Assessment

Work continues on the State Risk Project with assessments now primarily focused on the local level.

214 agencies engaged in State Risk Project

>2,300 participants in the State Risk Project

95 hazard scenarios produced for State and District Risk Project

4,904 risk statements assessed in State and District Risk Projects



CHAPTER 2

**INSIGHTS AND
OPPORTUNITIES**

02 INSIGHTS AND OPPORTUNITIES

INSIGHTS

- Capability topic scores and infographics within the SEMC Emergency Management Capability Framework allow the synthesis of large amounts of capability data and year to year comparisons.
- Capability data shows that areas that may require further attention from HMAs include:
 - Essential Services Protection
 - Sector Information Sharing
 - Public Information Tools
- LGs capability areas that may require further attention include:
 - Business Continuity Planning
 - Equipment and Infrastructure
 - Sustained Recovery
- ESPs capability areas that may require further attention include:
 - Public Information Tools
 - Agency Interoperability
 - Sector Information Sharing

OPPORTUNITIES

- The ability to quickly identify where the biggest capability gaps exist provides an opportunity to prioritise work programs including areas to ‘exercise’ as a state.
- Expanding the use of the Capability Framework and the data collected to assist other initiatives such as lessons management.
- The data gathered can be used as an evidence base to inform mitigation and treatment options – including future funding and sourcing opportunities (grants, capital and operational expenditure).
- Plans for the protection of water, sewerage, fuel may be enhanced amongst HMAs and ESPs and may form part of further business continuity work.
- Although sharing of information between state agencies is continuing to improve, sharing with LGs and communities can be meaningfully enhanced.
- HMAs can continue to expand their use of a variety of social media platforms to maximise their reach and increase two-way messaging.
- LGs could benefit from sharing best practice business continuity plans, templates and policies that are tailored for EM hazards/impacts.
- Multiple and concurrent larger scale emergency events are difficult to manage with existing equipment. Continuing to explore and communicate how resources can be allocated, distributed and shared across the state on a risk basis is important.
- The prospect of long-term recovery remains a challenge for most LGs. Continued development of memorandum of understanding (MOUs), training, mentoring and knowledge sharing processes in recovery is important as is the optimisation of how the DRFAWA can be applied.
- ESPs can continue to expand their use of a variety of social media platforms to maximise their engagement, reach and two-way interaction.
- The interoperability of communications systems with other agencies is cited as potential area for improvement.
- The sharing of information with communities about known risks and vulnerabilities is seen as an area for further development.

INSIGHTS

- The UN Sendai Framework for Disaster Risk Reduction and the Commonwealth's National Disaster Risk Reduction Framework (NDRRF) provide good guidance and mandate for the ongoing risk reduction and resilience building work of the SEMC.
- The world of EM is incredibly complex and involves a range of stakeholders. Their combined efforts and resources must come together seamlessly in times of crisis.
- SEMC has traditionally engaged with agencies and organisations on risk, capability and resilience building. WA requires a more enhanced and collaborative involvement with the community to incorporate preparedness at all levels.
- Rising global heat through climate change and the prevalence of more heatwaves, extreme weather events, sea level rise and coastal inundation needs to remain on the forefront of SEMC's agenda.

OPPORTUNITIES

- A new generation National Partnership Agreement and associated grants program will be established to accompany the NDRRF. SEMC will continue to align its grant(s) programs to promote projects that reduce risk across WA in an informed manner.
- Considering the international and national frameworks, SEMC will continue to work to engage the non-traditional EM stakeholders (e.g. industry, business, not-for-profit) and work to more formalise their involvement.
- Using the international/national lead in conjunction with state priorities to develop the next generation SEMC Strategy, work-plans and sub committee responsibilities.
- Under the NDRRF umbrella to promote the development of state mitigation policy, risk ownership parameters and strengthening the businesses cases for mitigation.
- Emergencies can quickly escalate and challenge existing capacities; understanding likely impacts can inform forward planning, mitigation and treatment options.
- The central role played by the SEMC can bring together the sector and associated areas in order to critically examine issues, clarify roles, identify gaps and form collaboration opportunities.
- The (often) long lead times required to achieve meaningful change highlights the need for enhanced cooperation and proactive planning.
- Community engagement is shown to be a critical process in building and maintaining a resilient Western Australia. Community engagement processes are shown to elicit greater behaviour change due to their two-way communicative and collaborative nature. SEMC seeks to continue to identify, support, raise the profile of and share promising community-led initiatives as well as broad, state-wide community resilience projects.
- SEMC's position and reach allows it to provide a collaborative platform for agencies and the community across the state. SEMC can continue to take a key role in providing appropriate messaging to stakeholders about climate change, particularly, how it will affect risks, vulnerabilities and impacts and promoting mitigation and adaptation planning.
- Enhance engagement with other jurisdictions (nationally and internationally) especially on catastrophic disaster planning is important.

INSIGHTS

- The less seen but potentially very damaging hazards need to remain on the SEMC's radar.
- Hazards such as animal and plant biosecurity, electricity supply disruption and HAZMAT (e.g. hazardous goods transport) and others can have very significant consequences for the state.
- The importance of planning for recovery including the management of emergency waste.
- The integrated nature of trade and operation (state, national and international) highlights the need for harmonisation of both legislation and regulatory intent.
- Many of the risks that we can expect to face are well known or predictable. If managed properly, many of the foreseeable issues can be treated, managed and effectively mitigated.
- Failure to think through, plan and prepare prior to an event may result in suboptimal actions during and after an emergency.

OPPORTUNITIES

- The risk profiling work of the SEMC for all 28 hazards provides awareness of the state's holistic risks and planning, preparation, exercising, etc., should always include those of low likelihood and high consequence.
- The interconnected nature of society be at the forefront of analysis as this in itself creates vulnerability. The interconnectedness includes power, communications, water, sewerage, road and rail, etc.
- The task of cleaning up and rebuilding after an emergency event can create significant implications for the environment, government, social setting and people. Planning before an event, when there is the time, should be considered a strategic imperative.
- SEMC believes in continuing to support emergency waste management partnerships within the sector and building on the work already undertaken following the Waroona Bushfire.
- Legislation and regulation are the primary governance mechanisms.
- It is important to ensure that multiple pieces of legislation covering various aspects of compliance and governance are examined, monitored and enforced to ensure that best practice is achieved.
- Climate change research provides a clear path towards likely impacts and a possible risk future.
- While we cannot remove all risk we are able to reduce our exposure.
- Cooperation and resource sharing are viable options to jointly identify, prioritise and manage risks.
- While the EM sector has been collaborating and cooperating well, there is an opportunity to broaden the range of stakeholders to achieve a more holistic approach.
- Recognising the diversity and uniqueness of individual communities can lead to the development of appropriate and tailored plans.
- Harnessing the innate skills and connections within each community is likely to strengthen resilience and lessen adverse impacts.

A wide-angle photograph of a desert landscape filled with numerous tall, weathered stone pillars of varying heights and shapes. The ground is sandy and sparsely vegetated with small, scrubby bushes. In the distance, a few people can be seen walking among the pillars. The sky is filled with large, billowing clouds, and the sun is low on the horizon, creating a golden glow and long, dramatic rays of light filtering through the clouds. The overall scene is serene and ancient.

CHAPTER 3

OVERVIEW

03 OVERVIEW

INTERNATIONAL

The Sendai Framework for Disaster Risk Reduction (Sendai) was implemented internationally in 2015.² It identifies that to strengthen resilience, countries must prevent new disaster risk and reduce existing disaster risk. The adoption of this framework represents a national commitment by countries around the world to strengthen resilience. The priorities of Sendai are:

1. understanding disaster risk
2. strengthening disaster risk governance to manage disaster risk
3. investing in disaster risk reduction for resilience
4. enhancing disaster preparedness for effective response and to 'build back better' in recovery, rehabilitation and reconstruction.

The growth of disaster risk means there is a need to strengthen disaster preparedness for response, take action in anticipation of events, and ensure capacities are in place for effective response and recovery at all levels. The recovery, rehabilitation and reconstruction phase is a critical opportunity to build back better, including through integrating disaster risk reduction into development measures.

NATIONAL





The Australian Government has developed the National Disaster Risk Reduction Framework (NDRRF; released in 2018³), to give effect to the intent, targets and priority actions outlined within Sendai. Led by the National Resilience Taskforce, more than 100 participants from more than 80 organisations in Australia came together to co-design a comprehensive approach to proactively reduce disaster risk.

Underpinning this work was a range of well-publicised drivers for action which are not always addressed well. These were:

- natural hazards are more frequent and intense
- essential services are interconnected and interdependent
- people and assets are more exposed and vulnerable
- disaster impacts are long term and complex
- costs of disasters are growing
- momentum to address financial impacts of a changing climate is building.

The release of the Australian framework is designed to give effect to the intentions behind Sendai. It sets out a 2030 vision detailing a range of national goals and priorities that align to our international obligations. The Australian framework is neither exhaustive nor prescriptive but recognises that disaster risk is a product of hazard, exposure, vulnerability and capacity.

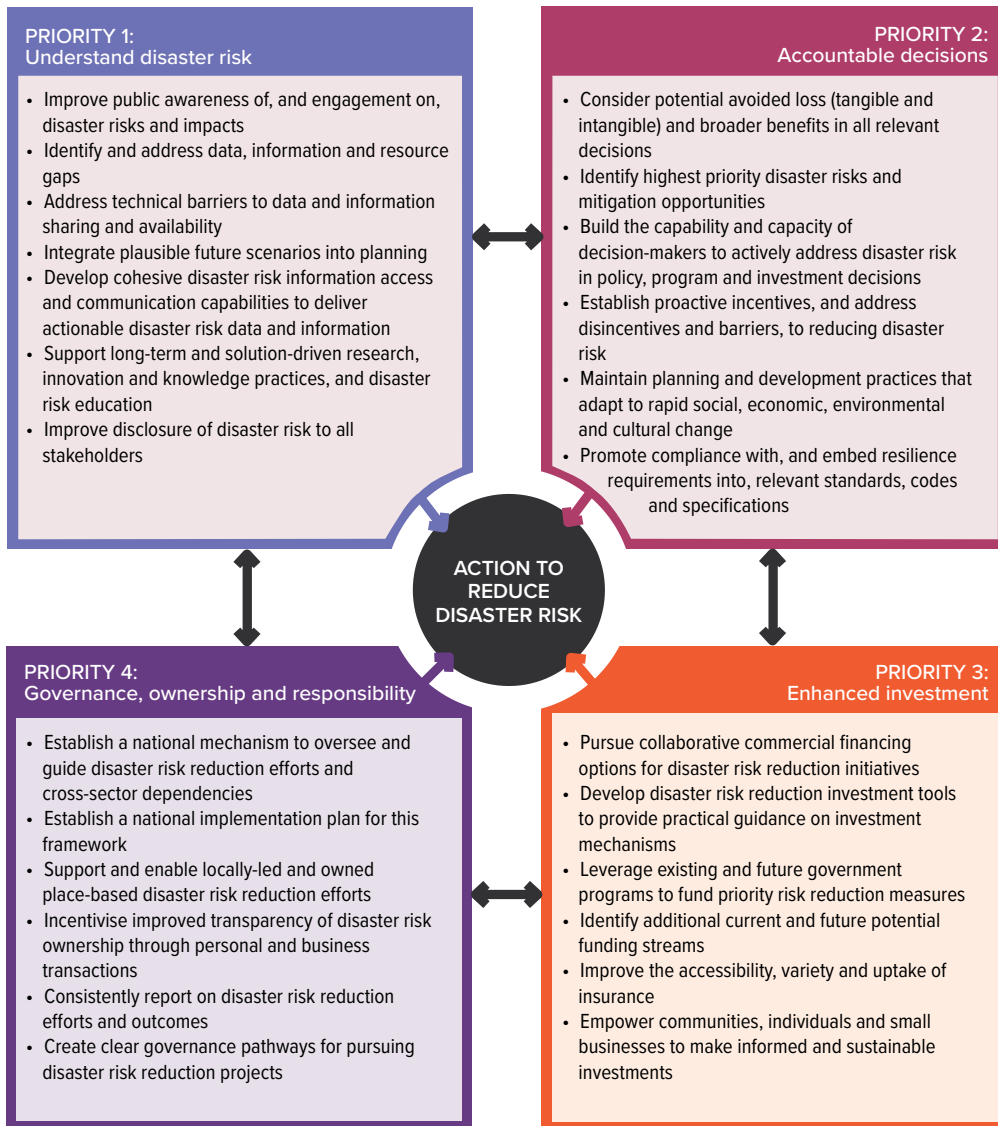
The framework seeks to guide efforts to reduce natural hazard disaster risk. The intent is that it be applied across and between four key environments: built, social, natural and economic.

	BUILT ENVIRONMENT Physical and social infrastructure assets such as transport, energy and tele-communications, water utilities, housing, cultural and commercial precincts, and other assets.
	SOCIAL ENVIRONMENT Socioeconomic and demographic trends, social networks and relationships, cultural practices, technology, innovation, wellbeing, essential services such as health and education, and lifestyles.
	NATURAL ENVIRONMENT Natural assets such as wetlands, rivers, land, forests, oceans, other complex natural ecosystems, agriculture, and water sources.
	ECONOMIC ENVIRONMENT Public sector, private sector and individual economic activities; workforce participation; credit, debt, and finance; and small, medium, national and multinational business.

National Disaster Risk Reduction Framework Environments⁴

Importantly, the framework captures the actions and responsibilities required across society. It identifies various areas for industry, business, the not-for-profit sector, communities and individuals.

Through unified action, it is hoped that disaster risk will be reduced and that, as a nation, we progress to become more resilient.



National Disaster Risk Reduction Framework priorities⁵

STATE EMERGENCY MANAGEMENT COMMITTEE

The State Emergency Management Committee (SEMC) and the EM sector have been working for many years to strengthen the state's resilience.

WA experiences a wide variety of hazards that have the potential to cause loss of life, damage and destruction. The *2018 Emergency Preparedness Report* identified that an already mature and cooperative sector has further consolidated and enhanced service delivery. But the sector's reach and influence can only go so far.

The SEMC is focused on continuous improvement and communication in the sector to strengthen ties and increase the effectiveness of its reach. Bringing stakeholders together and seeking to better understand hazards is integral for laying the foundations for the future. The SEMC has had a longstanding focus towards understanding the risks that we face, the capabilities we have to hold against them and the impacts that may ensue.

Building on the data collected in previous emergency preparedness reports the SEMC has sought to anticipate and address arising issues.

The data collected coupled with the relationships that have been built has placed WA in a strong position to maximise the benefits of the Commonwealth's focus on disaster risk reduction and mitigation.

Going forward, the SEMC will seek to capitalise on the good will that has been built and leverage work that is already underway. They will draw heavily on the insights and opportunities from this and the previous emergency preparedness reports and the assessments of risk and capability.

Reviewing the SEMC Strategic Plan to incorporate governance arrangements and work plans into the future will address identified issues. This will likely include formal tasking arrangements through the existing SEMC subcommittee structures. In fact, much of the work is already well advanced or at least underway.

Examples include the development or continuation of:

- the State Exercise Framework
- Community Resilience Framework
- examination of mitigation policy and mitigation business cases
- helping each other/neighbours prepare
- capitalising on the good community work already out there.

EMERGENCY MANAGEMENT

EM is a complex environment that encapsulates a broad range of actions and activities that are involved before, during and after emergencies.

Emergency preparedness is at the forefront of this, once we acknowledge the assessment that it is inevitable that we can and will be impacted. The pre-emptive nature of addressing emergency preparedness brings with it a language where terms with distinct and important meanings are introduced and examined in detail.

Terms such as risk, exposure and vulnerability come to the fore. From here, risk assessments and evaluations deliver things such as a risk matrix which introduces terms such as likelihood and consequence. These in turn have defined meanings and assess likelihood on a range from extremely rare through to almost certain, while assessing consequences from insignificant to catastrophic.

For WA, credible worst-case scenarios are developed and run to test the readiness of the systems and procedures that are in place. Subject matter experts from government, industry and the scientific community come together to formulate scenarios that represent realistic situations that the state may be forced to confront due to an emergency.

These are then explored in depth in a workshop setting attended by agency, industry, government, LG and community representatives. What will be affected and how it may be impacted are examined in detail, including the flow-on impacts of an incident.

Chapter 7 of this report represents just such a credible worst-case scenario. This is included not to shock or frighten, but to highlight the extreme depth of thinking and planning that has been the mainstay of our state's emergency preparedness. This has been the case for many years and has been applied comparably across all of the prescribed hazards that we might face.

The language can at times be perceived to be inflammatory or sensationalist but in fact they reflect a tried and tested, systematic and structured risk assessment process.

LIKELIHOOD	CONSEQUENCE				
	Insignificant	Minor	Moderate	Major	Catastrophic
Almost Certain	Medium	Medium	High	Extreme	Extreme
Likely	Low	Medium	High	Extreme	Extreme
Unlikely	Low	Low	Medium	High	Extreme
Rare	Very Low	Low	Medium	High	High
Very Rare	Very Low	Very Low	Low	Medium	High
Extremely Rare	Very Low	Very Low	Low	Medium	High

National Emergency Risk Assessment Guidelines (NERAG) 2015 risk matrix

Once the nature and extent of the risk is understood new terms like risk treatment or control are introduced. Risks can generally be:

- **avoided** by eliminating or ceasing the activity
- **treated** by reducing or mitigating the likelihood or consequence
- **shared** through transferring or outsourcing (such as the use of insurance or entering into partnerships)
- **retained** by accepting the risk if it cannot be avoided, reduced or transferred.

Not all risks can be eliminated and the enduring or residual risk that remains, after treatment, should have plans for managing and funding the consequences of the risk if it occurs. This is the underlying tenet that is at the heart of emergency preparedness in WA.

Emergencies regularly deliver extreme circumstances that stretch and even overwhelm existing resources. Understanding this, planning for and acting upon it is the goal of the SEMC and has been the communal focus of the sector for many years.

REPORT STRUCTURE

The *2019 Emergency Preparedness Report* represents a significant shift in focus from previous versions. Unlike previous reports, this year it has focused on the complexities that could arise during emergencies.

In 2012 the SEMC developed six core objectives that were considered of critical importance to the wellbeing of the state—people, social setting, economy, infrastructure, governance and environment.

In reality, a single emergency is likely to impact upon several of the state core objectives simultaneously. When hazards are examined individually (depending on the size, nature and location of the emergency), they will affect the six core objectives differently.

The *2019 Emergency Preparedness Report* delivers an abridged examination of six complex issues that will (predominantly) impact upon a different state core objective. Topics chosen are:

1. Heatwave
2. Animal and plant biosecurity
3. Transportation of hazardous materials
4. Management of emergency waste
5. Addressing climate change and coastal hazards
6. Community engagement.

The sixth examination chosen, and the first one addressed is community engagement. This is possibly the most critical as it is relevant to all of the state core objectives. It is the primary mechanism to interact with the people of WA and represents the clearest path to building resilience.

The examinations contained within this report are abridged versions. They do not reflect the full complexity of the issues but provide insight into the depth and breadth of matters that come to light before, during and after an emergency.

People

To protect the lives and wellbeing of people.



Economy

To maintain and grow the state's productive capacity.



Infrastructure

To maintain key infrastructure such as transport and utilities.



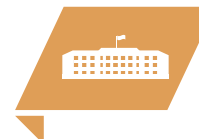
Social setting

To maintain public order, safety, sanitation, education, health and culture.



Governance

To maintain public administration, democracy and rule of law.



Environment

To protect the ecosystem and biodiversity of the state.



The State Core Objectives

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CHAPTER 4

**PREPAREDNESS
REPORTING**

04 PREPAREDNESS REPORTING

As in previous years, the 2019 *Emergency Preparedness Report* is completed using the findings of the Annual and Preparedness Report Survey (the survey). This in turn is based on the [SEMC Capability Framework](#).



SEMC Capability Framework

This framework describes the elements that are needed for the state to be 'capable' when preventing, planning for, responding to and recovering from emergencies.

It comprises three levels:

- 7 overarching capability areas
- 33 core capabilities
- 47 achievement objectives.

2019 SURVEY AND ANALYSIS

This year, 156 responses to the survey were received^a (Appendix A). For the first time, it has been possible to make widespread comparisons between 2018 and 2019 as minimal changes were made to the questionnaire or categorisation of agencies.

Reflecting their respective roles, the organisations that answered the survey were categorised as follows:

- Hazard Management Agencies (HMA)
- Local Governments (LG)
- Essential Service Providers (ESP)
- Combat Agencies (CA)
- Emergency Support Services (ESS)
- Industry Bodies/Other (IB).

A full list of the individual respondents in each organisation type is provided in Appendix A. The information is based on self-reported data drawn from the respondent's perception of their organisation's capability^a. As such the data provides indicative areas for further examination rather than providing definitive conclusions.

For the first time, the data has been analysed by capability topics^b. Questions have been themed and grouped selecting those applicable to each organisation type. Seventeen capability topics for (HMAs) and 23 capability topics for LGs (see Appendix B).

These align with 19 of the framework's 33 core capabilities. We then calculated a score for each of the capability topics to make comparisons between them. This report discusses this information while recognising that not all capability topics apply to all organisational types.

By using the same survey questions and applying new data analysis techniques, we have been able to answer the following questions about WA's EM sector:

- Where is it most capable?
- Where has capability improved the most over the past year?
- Where can capability improve in the future?

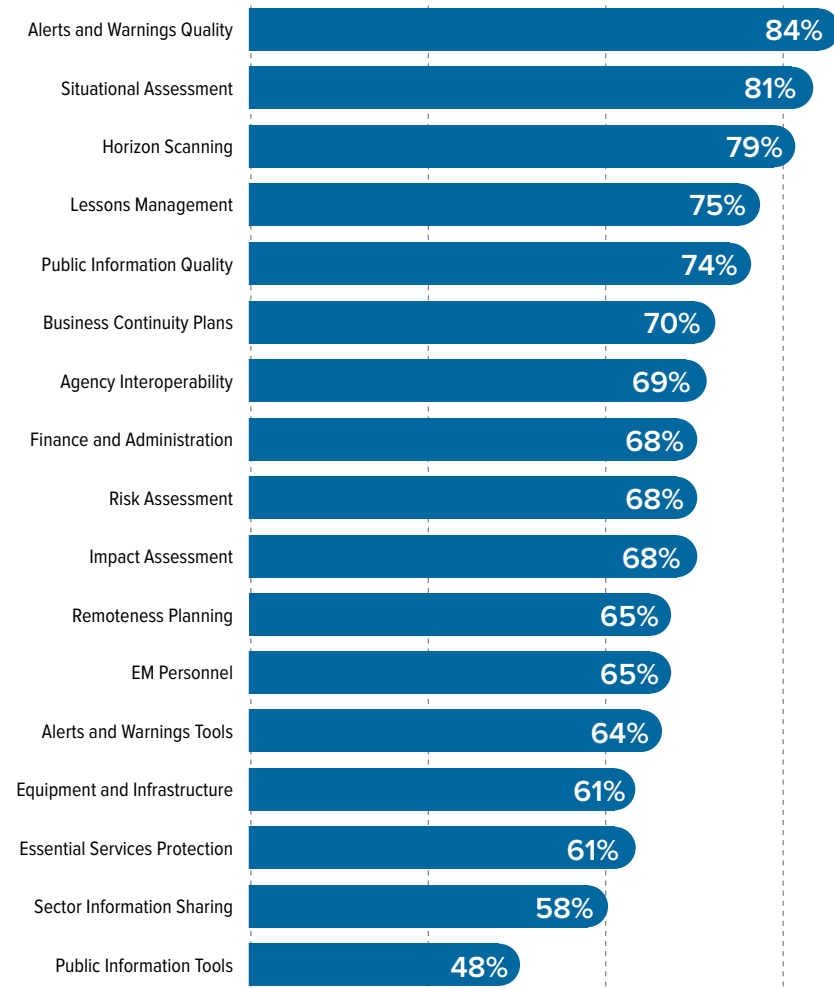
A summary of some of the key capability findings can be found in the following infographics.

a Information in Chapter 4 is based on self-reported data, the number of organisations within most organisation types are small, and not all findings may be relevant to all respondents within an 'organisation type'. The data is based upon the respondent's perception of their organisation's capability. The topic scores are an aggregation of multiple answers from several respondents. Small changes (~ ± 5%) between 2018 and 2019 may not necessarily indicate a change in actual capability. Rather than providing definitive conclusions, this reports' value lies in indicating potential trends between agencies, between capabilities and over time. It is a useful starting point for the WA EM sector to identify areas for further investigation.

b In previous years, the survey results were analysed by looking at responses to individual questions only, with reporting at the 'achievement objective' level of the framework. More detail can be found in Appendix B.

HIGHEST CAPABILITIES IN 2019: HAZARD MANAGEMENT AGENCIES (HMAs)

The infographic below lists the 17 capability topics applicable to WA's 8 HMAs. They are presented in order of highest reported capability at the top, to the lowest at the bottom, for 2019. This information is based on the survey responses provided by the HMAs.



So which capabilities are the highest for HMAs...



Alerts and Warnings Quality

HMAs are responsible for communicating key messages to the public during emergencies. These messages can mean the difference between life and death. The majority of HMAs reported having procedures in place to ensure the alerts and warnings they provide during emergencies are coordinated, timely, reliable and actionable.



Situational Assessment

Situational assessments are conducted during emergencies to inform an agency's response and recovery activities. This was HMAs' second highest capability. All HMAs reported that their situational assessments determined the nature and extent of the hazard, and the vulnerable elements, with seven of the eight also determining the resources required. On average, HMAs reported their situational assessment's effectiveness as 'substantial'.

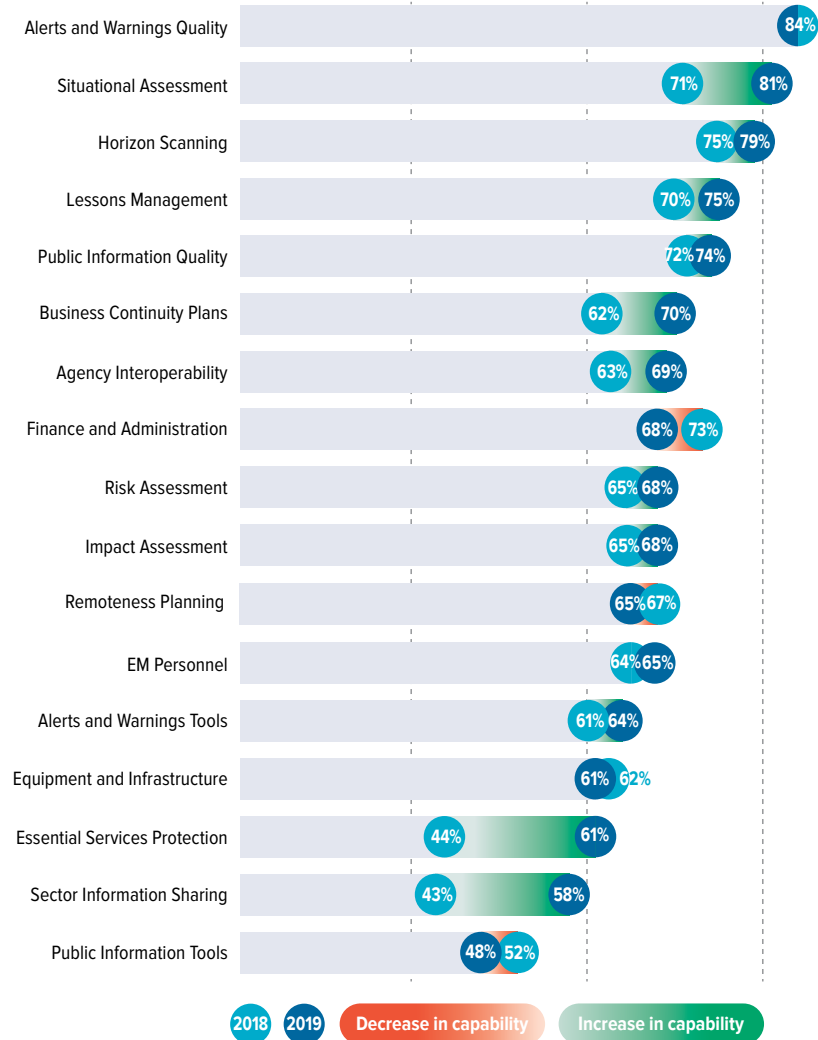


Horizon Scanning

To ensure processes and procedures are evidence-based, HMAs on average, reported substantial capability in reviewing recent hazard publications and monitoring events occurring within WA, interstate and overseas.

CAPABILITY COMPARISONS FROM 2018 TO 2019: HAZARD MANAGEMENT AGENCIES (HMAs)

The infographic below lists the 17 capability topics applicable to WA's 8 HMAs. They are presented in order of highest reported capability at the top, to the lowest at the bottom, for 2019. The 2018 score is also provided for each capability topic to show areas of improvement. This information is based on the survey responses provided by the HMAs.



So what improved and what might require further attention...



Situational Assessment

As well as being HMAs' second highest reported capability, Situational Assessment showed the third greatest improvement between 2018 and 2019. Several HMAs commented on the benefits of Webfusion for improving situational awareness across agencies, as it allows multiple agencies to view and share information. Overall, the main reason for this improvement is the Public Transport Authority's reporting of situational assessment capabilities.



Essential Service Protection

The area of greatest improvement for HMAs is the protection of essential services. All HMAs reported having telecommunications continuity plans, and seven of the eight HMAs have plans to protect their electricity supply. One matter of significant concern for emergency response are the interdependencies. For example, the rollout of the nbn™ will make all telecommunications dependent on the supply of electricity. However, while there was great improvement, this capability still ranked in the bottom three. Protection plans for water, sewerage, fuel and food distribution are the next steps for HMAs to further improve this capability.



Sector Information Sharing

Showing the second greatest improvement, increased information sharing by HMAs was primarily related to vulnerable elements and risk treatment options. HMAs share information through mechanisms such as LEMC and DEMC meetings, Webfusion, and joint exercises and plan development with a range of organisations including industry. While the mechanisms and capacity for information sharing between agencies have improved, meaningful information sharing with LG and communities is lacking, resulting in this capability also being in the bottom three. Progress is needed to expand information sharing to LGs and communities to improve WA's overall resilience.



Public Information Tools

This was HMAs' lowest reported capability. Historically, HMAs have tended to release public information through more traditional routes. While most HMAs reported using websites, Facebook and public talks to disseminate information about prevention, preparedness and recovery, only a quarter reported using YouTube and Instagram. In contrast, half of ESPs reported using Instagram as a public information tool. With around half of Australians using YouTube and one-third using Instagram⁶, these are potential additional tools for HMAs to consider.



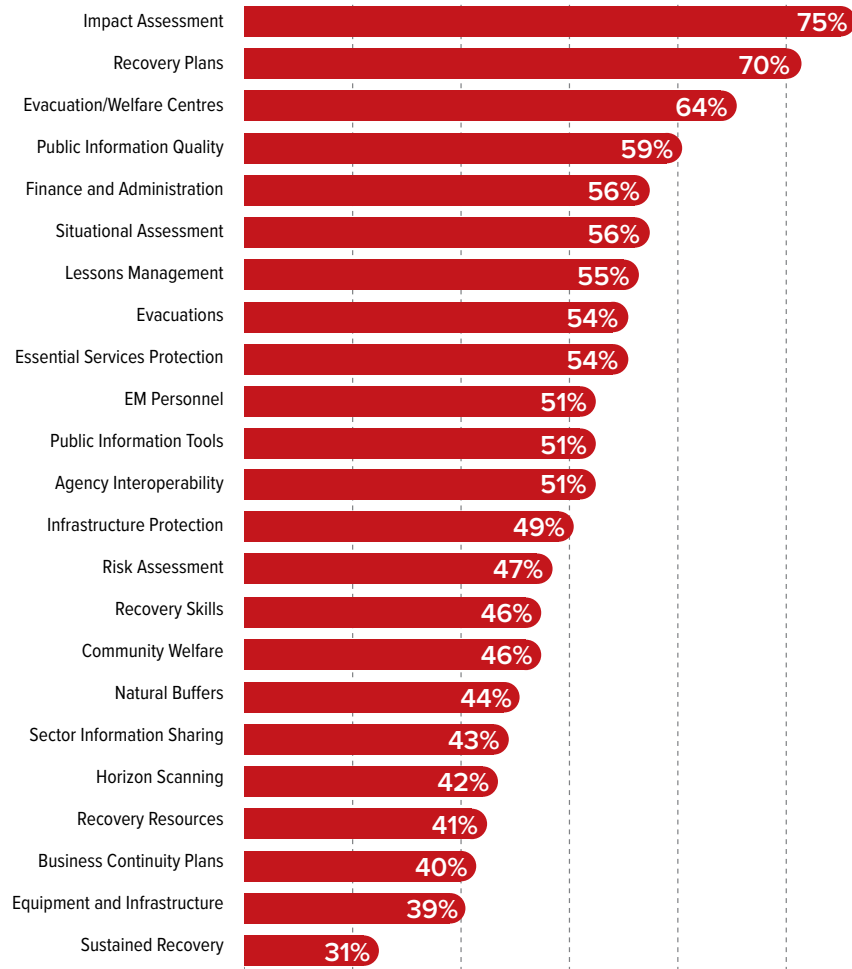
Finance and Administration

While the Finance and Administration score for HMAs decreased slightly from 2018 to 2019, it still remained relatively high overall. The key reason for this drop was a single HMA respondent saying that funding for proactive measures/mitigation was available, sufficient and accessible in 2018, but was not in 2019. Additionally, this HMA reported that funding for response and recovery activities was sufficient in 2018 but was not 2019.

HIGHEST CAPABILITIES IN 2019: LOCAL GOVERNMENTS (LGs)

The infographic lists the 23 capability topics applicable to WA's 137 LGs. They are presented in order of highest reported capability at the top, to the lowest at the bottom, for 2019.

So which capabilities are the highest for LGs...



Impact Assessments

After an emergency, LGs can contribute to comprehensive impact assessments (CIAs) and use this information for their EM processes. About three-quarters of LGs reported having the ability to contribute to a CIA and using the findings to inform their priorities for recovery coordination, EM planning, and prevention and mitigation. This was LGs' highest reported capability.



Recovery Plans

Strong recovery plans benefit from the input of multiple stakeholders. Most LGs reported their recovery plans had input from HMAs, CAs and ESPs and, to a lesser extent, from communities and non-government organisations.

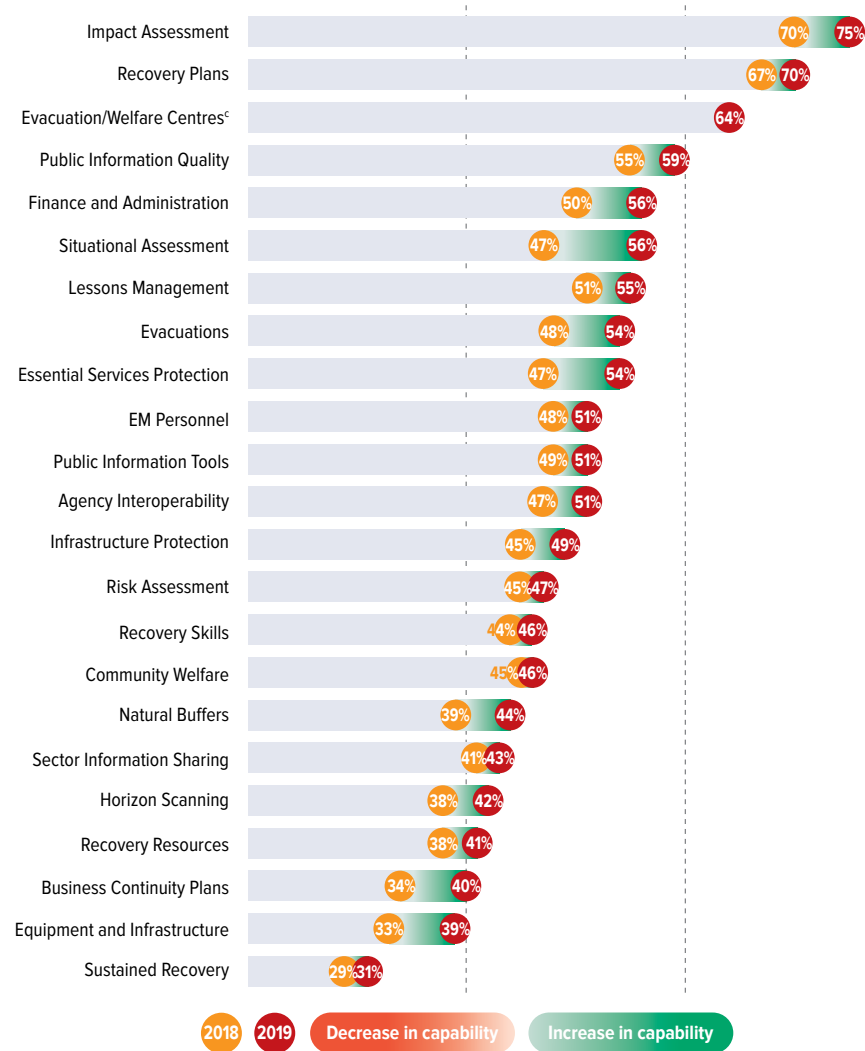


Evacuation/Welfare Centres

LGs are responsible for identifying suitable evacuation centres and providing this information to HMAs and the Department of Communities. Nearly all LGs reported having suitable evacuation or welfare centres. Of these, over half reported redundancies for food, water and power, making this LGs' third highest capability.

CAPABILITY COMPARISONS FROM 2018 TO 2019: LOCAL GOVERNMENTS (LGs)

The infographic below lists the 23 capability topics applicable to WA's 137 LGs. They are presented in order of highest reported capability at the top, to the lowest at the bottom, for 2019. The 2018 score is also provided for each capability topic to show areas of improvement.



^c Unable to calculate evacuation/welfare centres capability topic score for 2018

So what improved and what might require further attention...



Situational Assessment

LGs recognise the value of conducting situational assessments during an emergency to assist their recovery planning. This was LGs' greatest area of improvement, with more LGs reporting having conducted assessments during emergencies.



Essential Services Protection

This was LGs' second greatest area of improvement. A greater proportion of LGs reported having plans to protect the continuity of their essential services, particularly power supply and food distribution for their organisation. The majority also reported having plans to protect the continuity of their own services.



Business Continuity Plans

Incorporation of hazard specific risk information and fatigue management strategies in business continuity plans has been the main driver of improvements since 2018. While two-thirds of LGs have a business continuity plan for emergencies, many reported that further work was needed to raise the quality of these plans, resulting in this also being in the bottom three capabilities. Further work could include sharing of best practice plans and LG policies.



Equipment and Infrastructure

Fewer than half of LGs reported being able to manage multiple concurrent 'moderate' emergencies with existing infrastructure and equipment, resulting in this capability being in the bottom three. Additionally, more work is required for LGs to have formal and embedded plans for equipment mobilisation, pre-deployment, peak surges and redundancies for outages.

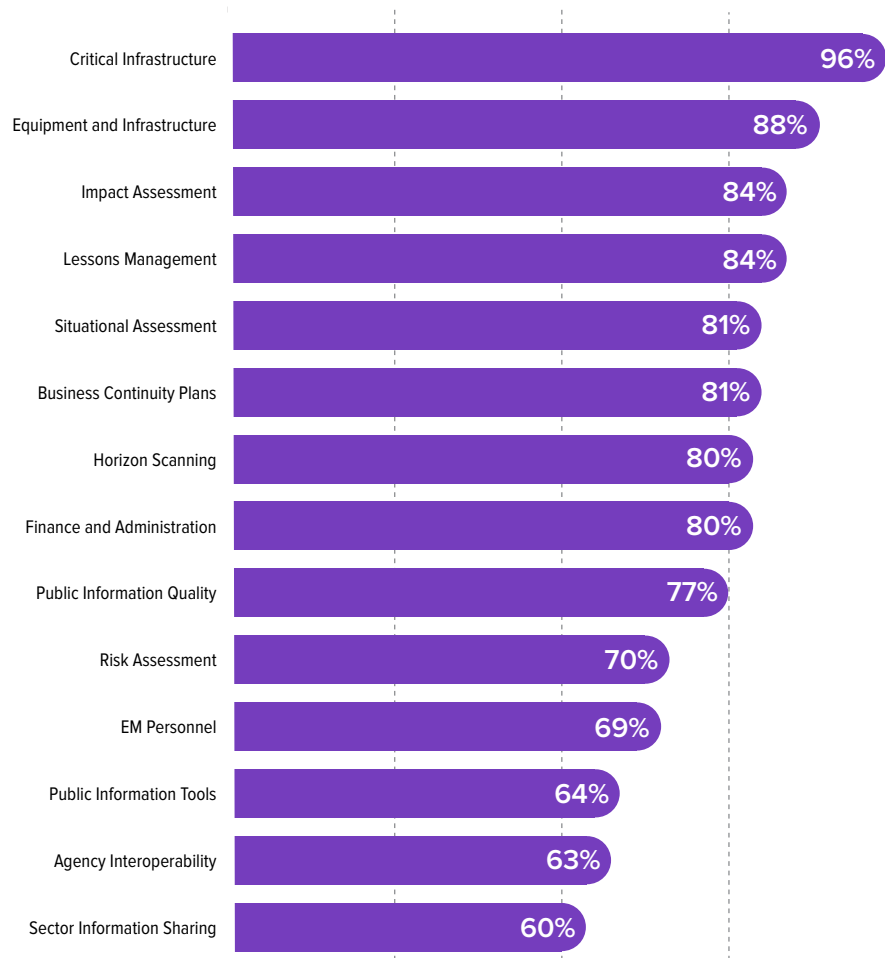


Sustained Recovery

Across all capabilities, and all organisational types, sustained recovery for LGs was the lowest reported capability. This is of considerable concern as LGs in WA do experience long-term recovery periods. Through this survey, ten LGs reported managing recovery periods of 1.5 years or longer as a result of floods in 2017 and 2018. The Shire of Gnowangerup's reported recovery lasted 2.5 years. However, only 1 per cent of LGs reported having sufficient resources to sustain a recovery for 1.5 years. Several LGs, particularly smaller ones, said significant external assistance would be required as there was little or no funding beyond business as usual.

HIGHEST CAPABILITIES IN 2019: ESSENTIAL SERVICE PROVIDERS (ESPs)

The infographic lists the 14 capability topics applicable to WA's 8 ESPs. They are presented in order of highest reported capability at the top, to the lowest at the bottom, for 2019.



So which capabilities are the highest for ESPs...



Critical Infrastructure

Protecting their critical infrastructure was ESPs' strongest capability. All ESPs identified hazards that may impact their critical infrastructure and have highly developed plans in place to protect these.



Equipment and Infrastructure

All ESPs reported high capability to manage multiple, concurrent 'moderate' emergencies with existing equipment and infrastructure, making this their second strongest capability. Most ESPs reported having formal and effective plans for equipment mobilisation, pre-deployment, peak surges and outages.



Impact Assessment

All ESPs stated they have the ability to contribute to a comprehensive impact assessment. Seven of the eight ESPs reported they used the findings of these assessments to inform recovery coordination, and most noted they also inform priorities for EM planning, and prevention and mitigation.

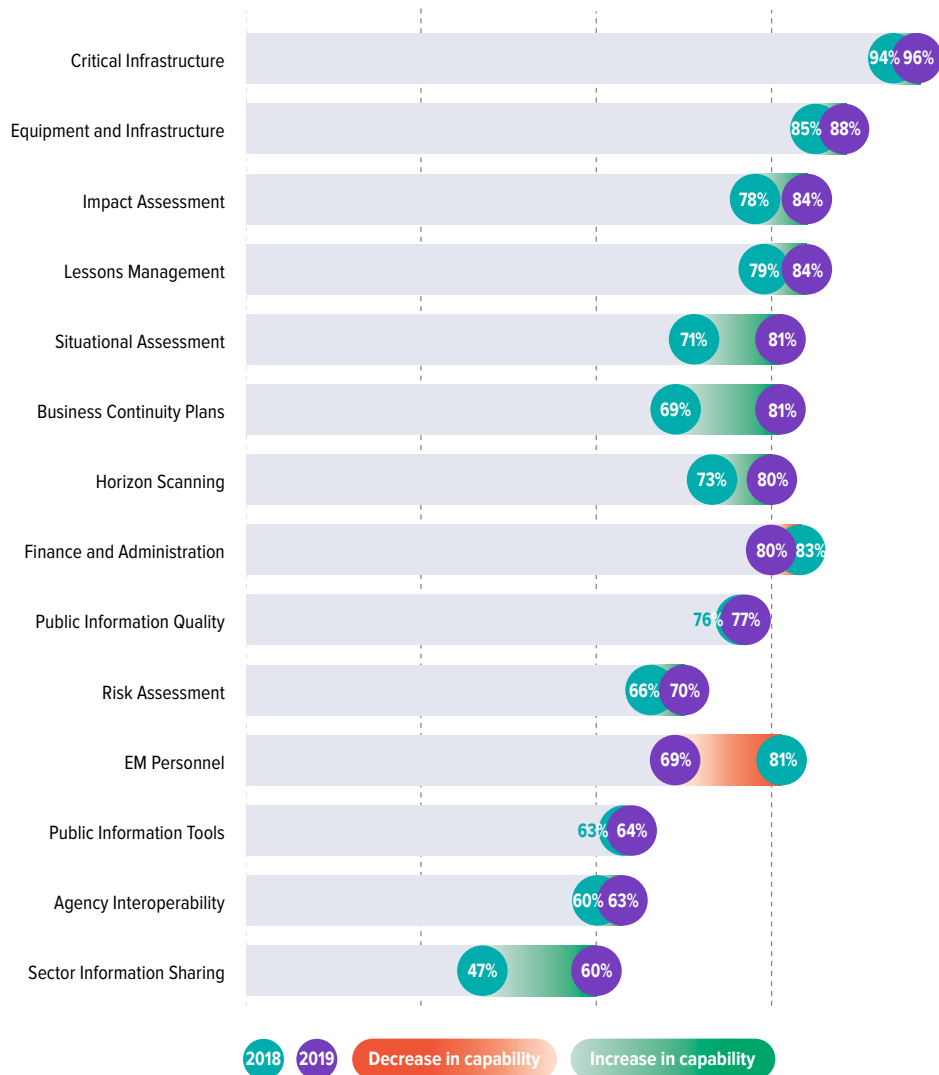


Lessons Management

All ESPs reported conducting evaluations of their performance following an incident, emergency or exercise, with half of these evaluations described as 'comprehensive'. Most ESPs reported 'comprehensive' or 'substantial' assessment/ amendment based on the findings of incidents, response, recovery and exercises. ESPs reported lower levels of assessment based on recent hazard information e.g. research.

CAPABILITY COMPARISONS FROM 2018 TO 2019: ESSENTIAL SERVICE PROVIDERS (ESPs)

The infographic below lists the 14 capability topics applicable to WA's 8 ESPs. They are presented in order of highest reported capability at the top, to the lowest at the bottom, for 2019. The 2018 score is also provided for each capability topic to show areas of improvement.



So what improved and what might require further attention...

Situational Assessment

This was ESPs' third biggest improvement, with most ESPs reporting their situational assessments determined the nature and extent of the potential hazard, the vulnerable elements and the resources required.

Business Continuity Plans

ESPs have improved the quality of their Business Continuity Plans, with many reporting that they are mostly effective and largely embedded within their organisation. This was ESPs' second greatest area of improvement.

EM Personnel

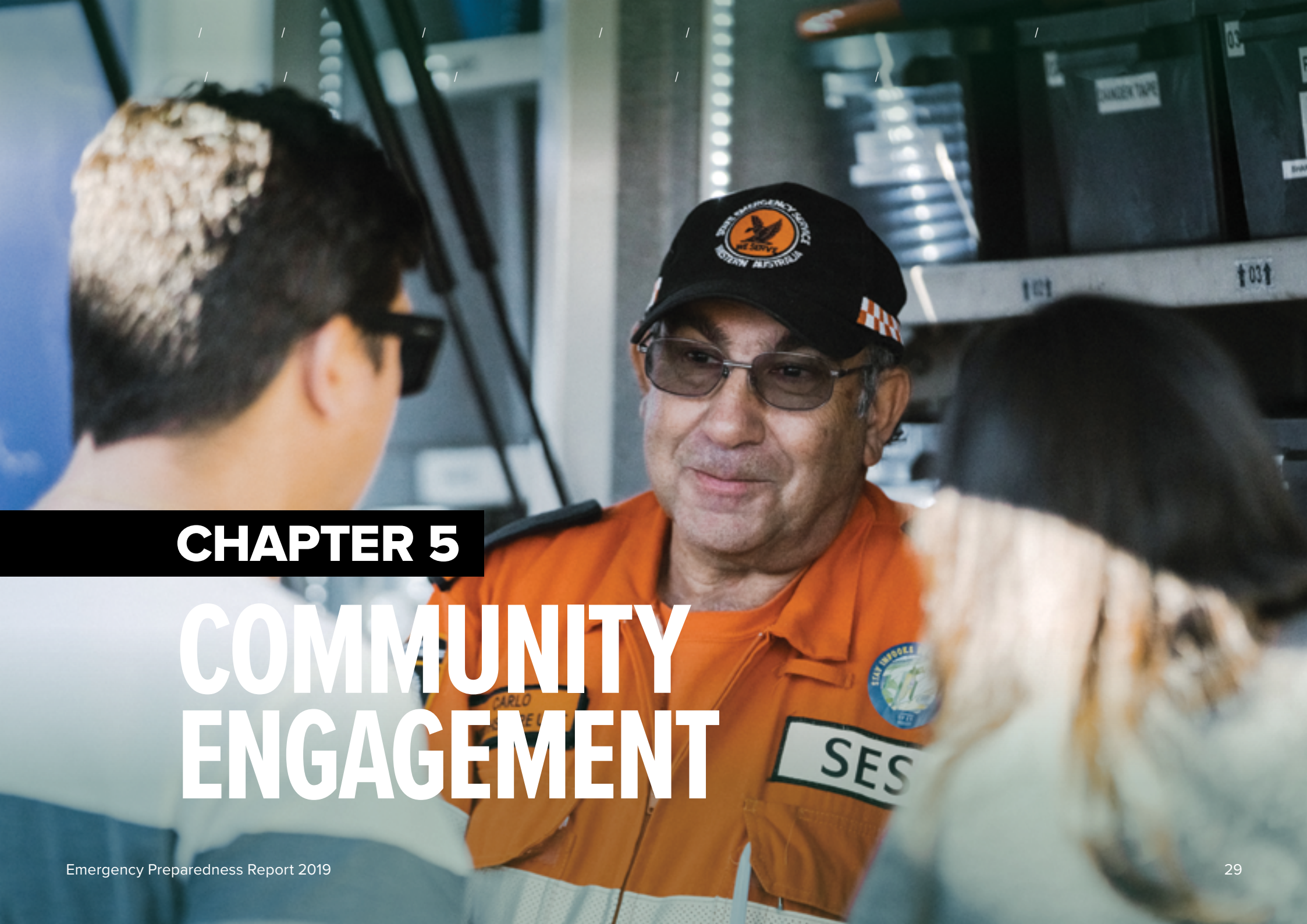
While the EM Personnel score for ESPs decreased from 2018 to 2019, it still remained relatively high when compared with HMAs and LGs (65% and 51% respectively in 2019). The main reason for this drop is a single ESP respondent reporting 'comprehensive' or 'substantial' levels for their recovery and prevention/mitigation personnel in 2018, and then not providing a response in 2019.

Agency Interoperability

Although ranked within the bottom three capabilities, all ESPs reported having established protocols and structures for emergencies that define the interrelationship between stakeholders. A potential area for improvement is the interoperability of their organisation's communications systems with other agencies.

Sector Information Sharing

ESP's greatest capability improvement is Sector Information Sharing. On average, substantial levels of information sharing occurs between state government agencies, and to a lesser degree LGs. Communications with business and industry regarding vulnerable elements and treatment options improved. The least information sharing occurred with communities, particularly around individual risks and vulnerable elements (though some information cannot be shared with the broader public for security reasons), resulting in this also being ESPs' lowest capability.



CHAPTER 5

COMMUNITY ENGAGEMENT

05 COMMUNITY ENGAGEMENT

Community engagement is the main process through which emergency services and HMAs work with communities to support and improve community preparedness and resilience.

Engaging with communities is important at all levels of EM, including the preparedness aspect of the EM spectrum of prevention, preparedness, response and recovery (PPRR). However, well-prepared households are also better able to respond effectively and recover following an emergency. In the case of an emergency, warnings are likely to be more effective in communities where engagement about risks, responsibilities, and protective actions has occurred before an emergency.

The National Strategy for Disaster Resilience (NSDR) defines community engagement as the process of working together with communities to “build resilience through collaborative action, shared capacity building and the development of strong relationships built on mutual trust and respect”.⁷

The NSDR Community Engagement Framework outlines a spectrum of community engagement from information provision through to participation, consultation, collaboration and empowerment.⁸ When the EM sector engages with communities, it acknowledges the critical role that community members play in emergencies, including:

- raising the awareness of imminent threats
- assessing risks

- developing preparatory actions
- delivering preventive measures
- identifying coping strategies and
- examining recovery options and alternatives.⁹

The SEMC appreciates the diversity and uniqueness, of communities. It recognises that there is no one answer and certainly no single approach to improving community preparedness and resilience. The focus must be on working with communities in a way that meets their needs.

The path to a more resilient WA requires community involvement. By adopting a culture of preventing and preparing for emergencies rather than simply reacting to them we can make our communities safer. To do this we must understand, accept and personalise our risks and work together to be more prepared.

A consistent theme has been that strategies, programs and initiatives need to recognise the inherent skills, capacities and connections within our community and we need to find the best ways to harness them.

In 2016 the Australian Business Roundtable for Disaster Resilience and Safer Communities recommended greater investment in programs that support community resilience and behaviour change. They argued that investing in community resilience would pay a double dividend, both reducing the cost of natural disasters and improving economic growth and wellbeing.¹⁰

The NSDR recognises that the disaster resilience of people and households is significantly increased by:

- active planning and preparation to protect life and property
- having an awareness of the threats relevant to their locality
- knowing and being involved in local community disaster or EM arrangements
- being involved as a volunteer.¹¹

FACILITATING BEHAVIOURAL CHANGE

Improving the safety and resilience of individuals and communities requires people to adopt new behaviours, or modify existing behaviours to improve their physical, psychological and social preparedness. Behaviour change is an ongoing, long-term process. Recognition by individuals and communities that they, or more vulnerable community members, are personally at risk is a strong motivating factor to take action.

Community engagement is recognised as a key mechanism to influence the behaviour of individuals. This often occurs through programs that consider the latest research and best practice to develop and deliver the most appropriate engagement model. The intent is to facilitate specific changes in behaviour that will lead to long term improvements in community preparedness and resilience.

Programs support change over time – from raising risk awareness, to helping identify appropriate actions and supporting their maintenance.

Well-designed messages can also help to support behaviour change. Getting the message right requires understanding of what influences behaviour, being clear about what needs to change, and understanding your target audience.¹² Some well-known behavioural influences include:

- past habits and routines are a strong predictor of future behaviour
- people tend to prioritise short term over long term rewards
- people will be more likely to act on information that is grouped into simple steps that are easy to understand
- people are more likely to act when they see others like themselves in their community taking actions – the effect of social norms.¹³

RECOGNISING THE RISK

Personal experiences and context help people to relate to and 'personalise' their risk. People who live in high risk areas or those who have recently experienced an emergency are more likely to accept that they could be personally impacted. Similarly, those who live in regional areas are more likely to acknowledge this and act.¹⁴

To enhance the likelihood of action, information about risk, planning and preparedness should be:

- **locally relevant**
- **provided by a trusted and knowledgeable source**
- **present opportunities for information exchange.**

Flood messaging

Research on flood fatalities in WA shows around half of all fatalities are vehicle related and that males are at greater risk. Flood fatalities can therefore be reduced by reducing the number of drivers entering flood waters.¹⁵

The Department of Fire and Emergency Services (DFES) is revising its flood messaging based on a review of previous messaging that identified some issues with the behavioural logic.

Commonly used messages were not resonating with drivers of vehicles nor causing the sought-after behavioural change – not to drive through a flooded road.

For example, the message “don't be fooled” labels the individual as unsafe not the behaviour, and most people believe others to be fools and not themselves. People are therefore unlikely to see this message as directed at them personally.

Research has found that drivers do not perceive floods as a threat. In some cases, they are even associated with recreation.

Such attitudes may have been exacerbated by mainstream media coverage. Almost without exception, the message of “**Do not drive through floodwaters**” was paired with images of somebody doing just that – without incident.

New messages will focus on:

- increasing the perception of threat and danger from flooded roads
- giving drivers the skills and knowledge to make informed decisions, based on depth, speed and road condition.



Research suggests that people are also more likely to be influenced by activities undertaken in their own communities rather than those being suggested and promoted from outside their community.¹⁶ It is this local and personal element of risk perception that makes face-to-face community engagement so effective in achieving change.

SPREADING THE WORD

There is already a great deal of EM information available for people to access. This information is delivered across a wide variety of platforms and aims to help people prevent, prepare for, respond to or recover from the types of shocks that emergencies can deliver. However, it is known that just making information available does not lead to behaviour change.

Widespread media campaigns are often used to deliver important safety and preparedness messages, but generally entail a one-way flow of information.

Face-to-face community engagement activities and programs are more likely to enable people to work together to:

- understand their personal risk
- accept responsibility
- take action.

Research undertaken by DFES in 2018-2019 in targeted high-risk bushfire communities showed that mass media campaigns were effective in improving the reach of the bushfire preparedness message. But face-to-face communication was more likely to lead to action.

Many LGs and agencies have dedicated community teams that specifically target at-risk groups. Delivering key messages through a range of mediums.

Both media campaigns and locally targeted communication and engagement contribute to community safety and resilience and improved physical, social and psychological preparedness in the face of an emergency.

Another way to improve the preparedness and resilience of our communities is through disaster resilience education.

An example of this is the Scouts WA State Emergency Service Awareness badge.

In April 2018, the scouting movement of WA launched a new SES Awareness badge.¹⁷

This is an example of a local partnership-based disaster resilience program focussing on young people.



The SES badge focusses on problem solving and critical thinking skills and a 'youth leading, adults supporting' approach to help young people build confidence, develop leadership, group skills and community connection. This is aligned to principles of disaster resilience education.

To earn the new badge, scouts must connect with their local SES unit, the local storm and flood experts, to investigate:

- their hazard risk
- understand their vulnerability
- engage in activities that increase their disaster resilience to storms.

Since its inception, 500 people aged from six to 25 years, participating at all levels of scouting (Joeys, Cubs, Scouts, Venturers and Rovers) have received the badge. Some of the activities that scouts have participated in include:

- making a survival kit
- researching hazard risks
- preparing the home for storms
- participating in mock emergencies
- building a sandbag wall.



Bushfire Ready is a community-led program that encourages and supports local residents to work together in preparing their properties and protecting their families from bushfires. The program aims to build the resilience of communities by providing the opportunity for neighbours to network, share ideas and information, and develop and implement strategies to reduce their bushfire risk.

The program involves DFES, LGs and local volunteer emergency services.

DFES' bushfire planning and preparation messages and resources are based around the concepts of a '5 Minute Fire Chat'.

The behavioural objectives of a Fire Chat is to get WA residents to plan prepare and take appropriate action when a bushfire threatens, beginning by having a conversation about bushfire with their household.



Households will be safer, even if having a Fire Chat is the only action that they take. The Fire Chat message is supported by and easy to use [Bushfire Preparation Toolkit](#).

[Disaster Resilience Education](#) (DRE) focuses on reducing disaster risk and increasing resilience in children and young people. Young people will be more resilient and more likely to have the confidence to take action to prepare for, prevent and respond to an emergency throughout their lives if they build relevant knowledge and skills early.

Children and fire safety

The DFES Home Fire Safety Program is designed to provide critical prevention messages to primary school children.

It is a series of curriculum linked classroom activities and lesson plans for Year 3 to Year 6 students and their teachers. Through this program, career firefighters are available to visit Year 3 students in their classroom in metropolitan Perth and larger regional centres.

The program draws heavily on the Bushfire and Natural Hazards CRC [Disaster Resilience Education Practice Framework](#), the program focuses on 'concrete actions and behaviours' that will improve safety and resilience.

Key activities include:

- crawling low under smoke
- participating in a school fire drill
- completing a home fire escape plan.

Children who have participated in DRE programs often:

- function better under pressure
- are quicker to act
- can adapt more easily to rapidly changing circumstances
- are able to develop long-term resilience.



Auslan fire safety presentation to students at Mosman Park School for Deaf Children

Source: Department of Fire and Emergency Services

The aim is to deliver developmentally appropriate materials on how children can respond to a fire emergency in their homes.

An evaluation in 2017–18, found that more than 80 per cent of participating students completed a home fire escape plan with their families.

ENGAGEMENT AND ONGOING ACTION

The way people receive and interact with information is evolving with technology. Traditional media remains highly relevant but the importance of social media and its various platforms have been steadily increasing in importance to EM. Social media allows for the instantaneous dissemination of information while also allowing the community to share, engage and interact with each other.

Social media statistics in Australia reveal that approximately:

- 60 per cent of Australians are active on Facebook (half using Facebook daily)
- half of all Australians use YouTube
- one-third use Instagram.¹⁸

In addition to its reach, social media is an important enabler for community level discussion about important topics. This presents the opportunity to have conversations, providing accurate information and potentially dispelling any myths or misconceptions. If managed well, social media is a valuable opportunity for the EM sector.

Many emergency services volunteer brigades, groups and units already have an active social media presence. This gives volunteers a platform to post about issues that are specific to their local community, share relevant preparedness and safety information, and promote the role they play in keeping the community safer.

Emergency services volunteers are therefore becoming more accessible, fostering interactions with members of the public, leading to greater community engagement.

WHAT ARE WE TRYING TO ACHIEVE AND HOW WILL WE KNOW WHEN WE GET THERE?

The aim of this is to engage the community and to encourage an attitude whereby people understand and accept their risk and take appropriate actions. Communities that understand their risk, and act to improve their preparedness will be more resilient to disasters.

However, community resilience, preparedness and the impact of any community engagement initiatives can be difficult to measure. There are many factors to consider. For example, the Australian Natural Disaster Resilience Index identifies two capacities, eight themes and 89 indicators for community resilience to natural hazards.¹⁹

Behavioural change can often take a long time and require multiple interventions.

Individuals and communities have different needs, motivations and levels of readiness to engage in preparedness actions. A one size fits all approach to community engagement does not work.²⁰

Notwithstanding the challenges, evaluating the effectiveness of programs is essential. Capturing the true impact of campaigns is essential to:

- assess if we have done what we set out to do
- learn what interventions worked and what didn't
- intensify effective change processes (or replicate them elsewhere)
- build knowledge
- guide future design.

Red Cross extends outreach program

The Australian Red Cross has extended its outreach program for communities affected by emergencies. Partnering with LGs, trained volunteers connect with impacted communities to:

- check on people's wellbeing
- link people to recovery information and available support
- conduct an informal needs assessment.

Since its inception, remoteness, or volunteer safety has occasionally made 'field outreach' untenable, leading to the rollout of telephone outreach.

In 2019, Red Cross volunteers called 619 households identified by LGs following the Lewana bushfire (February), Tropical Cyclone Veronica (March) and Jarrahwood bushfire (May).

Given the nuances of different communities we need to establish an evidence base to ensure that we are investing in programs that are well placed for success.

At times, shocks cannot be avoided or appropriately mitigated. At these times, we must be prepared to help our communities to cope, navigate through and recover from the impacts of emergencies.



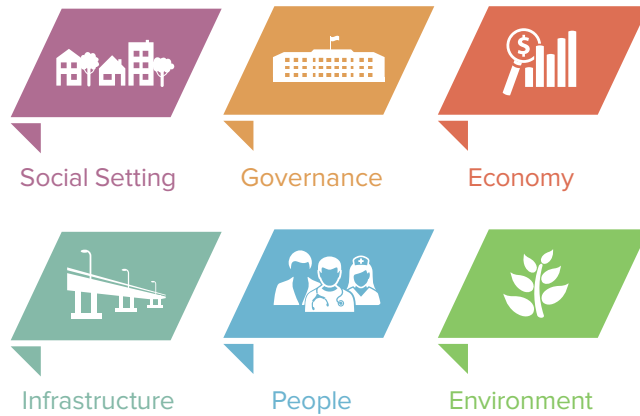
Australian Red Cross outreach program

Source: Australian Red Cross

LGs have added questions to the collection to allow them to gauge whether their support for the community has been effective. This information has been used to improve or strengthen their own service provision.

RELEVANCE

Effective community engagement is critical to building and maintaining a resilient WA.



There is no one single answer to complex issues. Knowledge, capacity and ability already exists throughout our communities. The challenge for EM will be to find effective ways to support and assist those actively seeking to build resilience, readiness and preparedness.

The SEMC through its preparedness reporting, capability collection, forward work plan and grants programs will continue to identify and promulgate promising initiatives across the sector. In this regard, an array of locally focussed resilience and preparedness projects have recently been endorsed under the 2018/19 Natural Disaster Resilience Program (NDRP) grants round.

The SEMC will continue to encourage and bring the sector and community together to explore avenues to support continuous improvement.

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CHAPTER 6

HEATWAVES

06 HEATWAVES

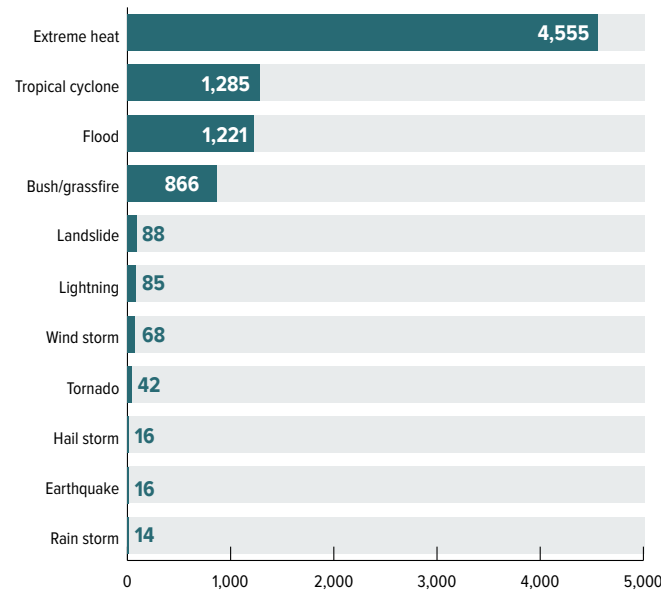
Natural disasters (such as floods, fires and cyclones) are dramatic. They deliver extreme conditions and images of danger, damage and destruction. These images impel people to act to take steps to protect themselves.

Heatwaves do not produce such drastic imagery nor do they tend to evoke a reaction but tragically they have been responsible for more deaths than any other natural disaster.

Ironically, in a hot country like Australia, heatwaves are poorly understood, often ignored and typically underestimated. A 2014 study of extreme heat events²¹ over the preceding 167 years in Australia revealed that:

- extreme heat killed as many people as the combined total of deaths from all other natural hazards
- around 31 per cent of these deaths occurred in just nine events
- it is likely that extreme heat has killed many more people than officially recorded.

The graph shows the mortality associated with natural disasters over a period of 110 years from 1900 to 2011.²²



Deaths per hazard 1900-2011

AN EXTREME CLIMATE SYSTEM

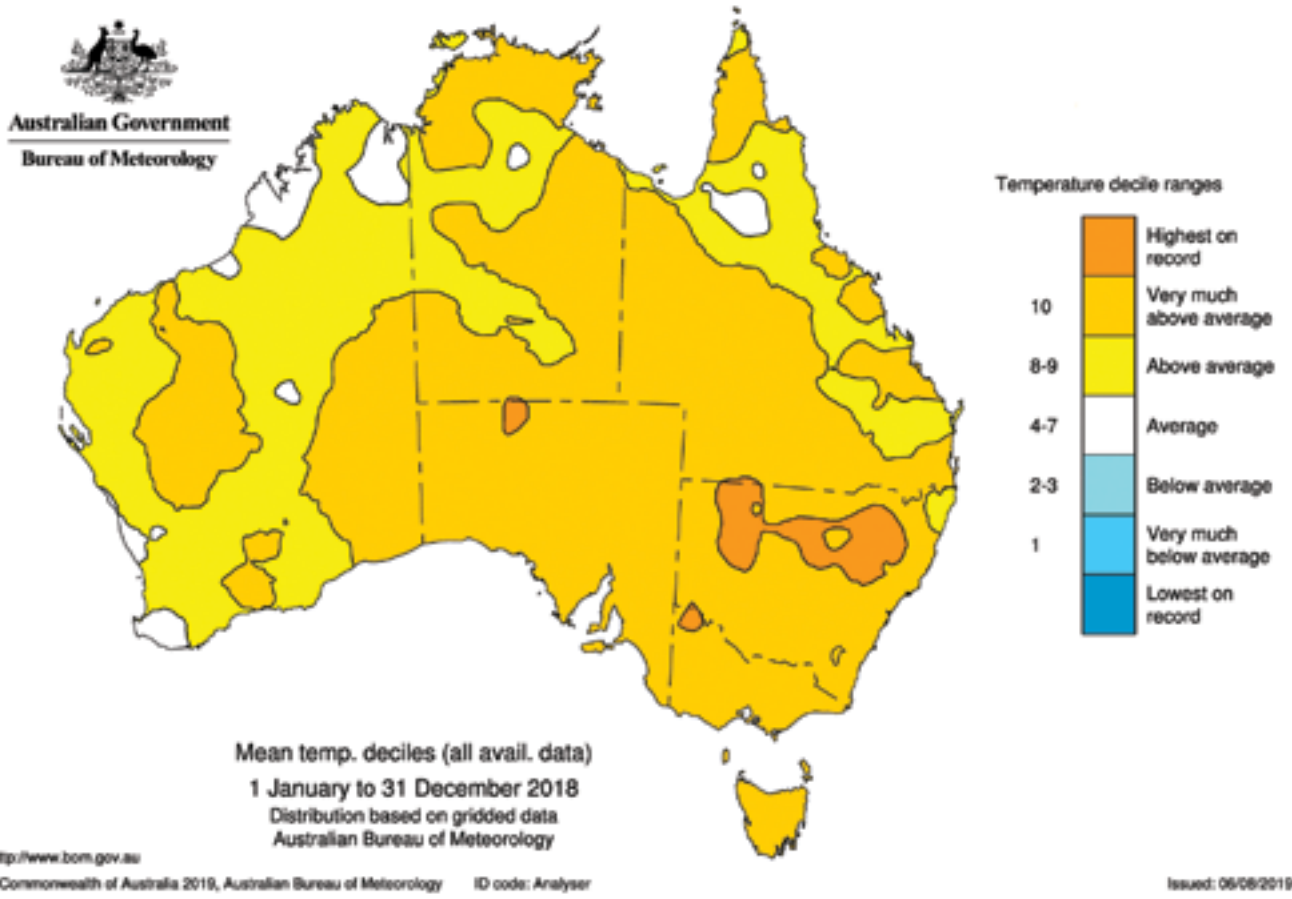
2018 was Australia's third hottest year on record, with the annual national mean temperature at 1.14°C above average. Climate change is intensifying around the world and our climate system continues to set new extreme heat records.

Both the annual maximum and minimum temperatures were above average across the country, and the annual national mean maximum temperature was the second hottest on record (1.55°C above average).

Widespread heat was persistent throughout the year. The mean temperatures for the months of January, February, March, April, July, October and December were all among the 10 hottest on record.

Commencing with a heatwave in late November in tropical Queensland, the 2018–19 summer evolved to be the hottest on record for Australia (by 0.86°C) and was the hottest for New South Wales, Victoria, WA and the Northern Territory. January 2019 was the hottest month on record nationally (by 0.99°C). New South Wales broke its previous record by more than 2°C.²³

This included an unprecedented sequence of five consecutive days with nationally averaged mean maxima above 40°C from 12 to 16 January, including the 15th, which recorded the second hottest day on record for any month.



Mean temperature deciles for 2018 in Australia

Source: Bureau of Meteorology

Numerous locations (87) reported their highest daily maximum temperature ever, with some locations exceeding their previous records by large margins.

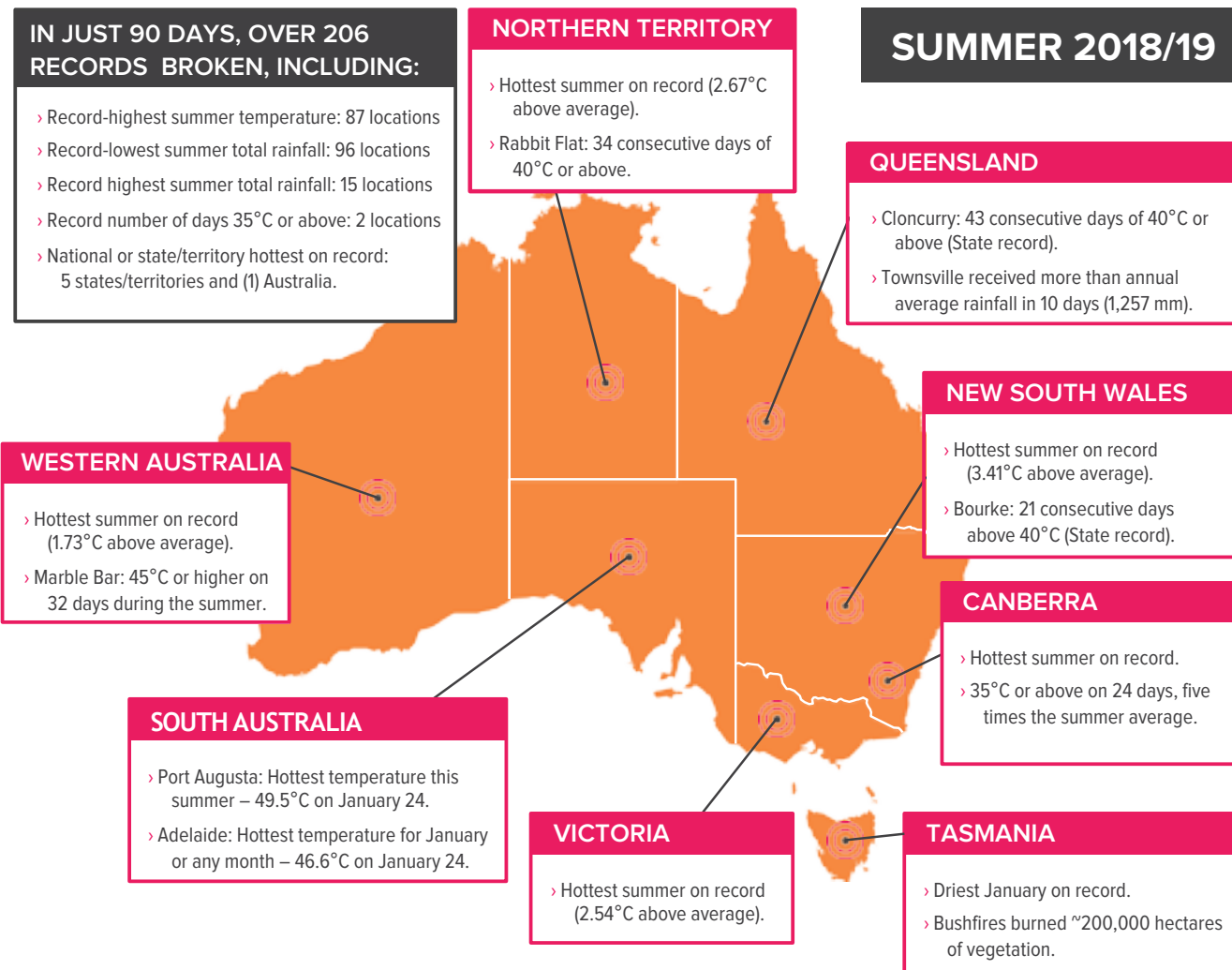
The Climate Council reported that “nine of Australia’s hottest 10 years have occurred since 2005, so the extremes in 2018 are part of a long-term trend, being driven by intensifying climate change.”²⁴

WHEN DOES ‘HOT’ BECOME A ‘HEATWAVE’?

One of the main concerns in assessing this issue is that there is no nationally agreed definition of a heatwave. There is no single temperature threshold, it changes for each location and varies state by state. Hot days with cool nights will allow some recovery from each day’s heat. But if the temperature stays high overnight, the next day’s maximum will be reached earlier and will last longer.²⁵

The Bureau of Meteorology (BOM) uses the Excess Heat Factor to understand the intensity of a heatwave within the local context.²⁶ This uses a formula that incorporates both maximum and minimum temperatures together with historical data from the past 30 years (for that location).

Because of the lack of a single definition for heatwaves across jurisdictions, calculations of their impacts also vary greatly. Different agencies cite different death toll figures, and it is often unclear which is the most accurate.



For example, following a two-week heatwave in South Australia (SA) in 2009, three different ‘official’ mortality figures were presented. The state’s public health department, SA Health, stated there were 33 deaths, the coroner’s office said there had been 58 deaths and PricewaterhouseCoopers put the figure at 96.²⁷

Heatwaves have traditionally been defined as a sequence of consecutive days where daily temperatures reach a designated threshold (Nairn 2013). Factors contributing to the health effects of heat include:

- maximum daily temperatures
- minimum night time temperature
- duration of the high temperatures
- humidity and air quality
- urban and rural design
- local acclimatisation.

In WA, a heatwave is defined in the [State Hazard Plan \(SHP\) Heatwave](#) as a ‘period of abnormally and uncomfortably hot weather, that is unusual for the location, and which could impact on human health, infrastructure and services’.

The heatwave response is based on a three-day average temperature (3DAT) calculation, which incorporates both maximum and minimum temperatures for the period. Humidity is accounted for also, as high humidity tends to lead to higher minimum temperatures.

Source: Climate Council

Note: For all statistics, the average is calculated over the period between 1961 and 1990. Records are for seasonal or monthly mean temperature unless otherwise specified.

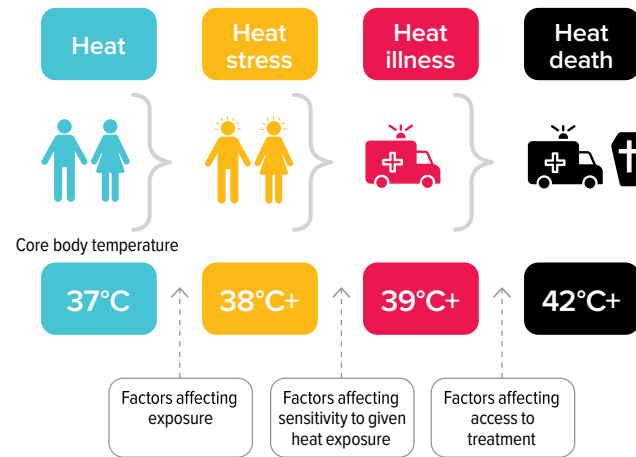
HOW DOES HEATWAVE AFFECT US?

The main concern from heatwave is the impact on people and their health. To maintain a healthy body temperature (between 36.5°C and 37°C), the human body has to adapt to ambient conditions. It does this by a combination of behavioural actions (such as moving into the shade) and physiological changes (such as sweating, and dilatation of blood vessels in the skin). Any factors which inhibit or overcome these responses will result in overheating.

Heat stress occurs when the body cannot cool itself enough to maintain a healthy temperature, and leads to symptoms such as lethargy, headache and muscle cramps. If the core body temperature increases to 40°C or more, heat stroke occurs and can lead to multi-organ failure and death.^{28,29} Heatwaves are also associated with non-fatal effects on health including:

- increase in cardiac arrests
- lower endurance
- increased fatigue
- impaired cognitive performance.

Increases in hospital admissions (particularly for kidney disease) and overall attendance at emergency departments have been found to be sensitive indicators of heatwave effects.^{30,31}



Points along the causal chain from heat exposure to heat death^{32,33}

WHO IS MOST AT RISK?

As is usually the case in emergencies, the most vulnerable people within our communities will be most at risk. It will be those least able to respond, such as elderly people, infants and children, pregnant women and people with chronic diseases. Socioeconomic factors also play a considerable role with the homeless and disadvantaged less likely to have the means to adapt their behaviours to keep cool.

But heatwaves also deliver impacts beyond those immediately considered. Outdoor occupations, such as construction, road repair and agriculture, and various other groups (athletes, people taking medications, tourists and culturally and linguistically diverse (CaLD) individuals) are all likely to be susceptible.

Large gatherings such as sporting events and festivals present additional challenges, especially where alcohol or illicit drugs are likely to be consumed.



Beach at Coral Bay

Source: Greg Snell

WHAT ELSE IS AFFECTED?

Heatwaves cause multiple impacts – to people, the buildings we live in and the infrastructure and services we rely on (transport, electricity and health services). In rural or semi-rural settings, they can have critical flow-on effects through increased bushfire risk. For city dwellers, these effects can be exacerbated by the urban heat island effect. But heatwaves also deliver other areas for concern.

The challenge lies in determining at which point the weather conditions become sufficiently hazardous to warrant intervention.³⁴

Direct impacts

Human health

- morbidity
- mortality



Infrastructure

- mechanical failure



Environment

- wellbeing
- death



Indirect impacts

Increased health and social service demands (e.g. increased ambulance calls)

Stop work

Lost productivity

Cancellation of social activities

Failure of essential services (e.g. electricity, water supply)

Interruption to transport (e.g. buckling train lines, melting roads)

Crop and livestock loss

Ecosystem impacts

Bushfires



Economic loss

Reduced personal finances (e.g. increased expenditure, reduced work, reduced savings)

Direct and indirect impacts of extreme heat

HOW DO WE RAISE AWARENESS OF THE HEALTH EFFECTS OF HEAT?

In a hot country like Australia, there is no room for complacency about heatwaves. We need to increase awareness of the seriousness of the effect of heat on health. But most importantly, a trigger to get people to act must be found.

The Department of Health, as the HMA for heatwave, relies on a cascade of communication to extend beyond government agencies to LG and non-government organisations to increase the reach of their message.

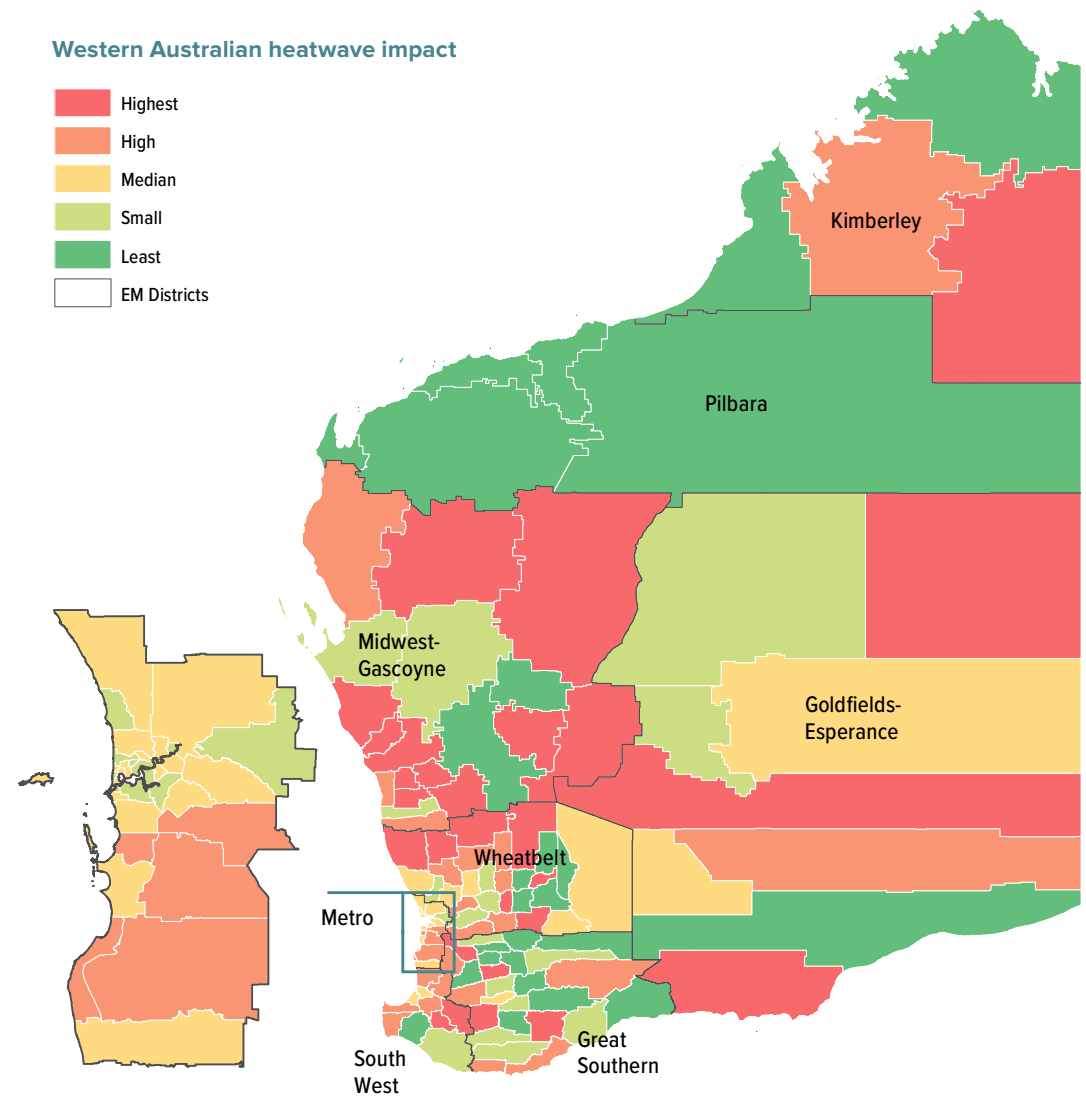
In 2017, the department worked with Curtin University and BOM to identify risk factors that might lead to population vulnerability to heatwave in WA.³⁵ The research identified the most vulnerable groups as:

- children aged 14 years or less
- people aged 60 or over.

In general, the more disadvantaged and remotely located the population, the higher the usage of health services. However, some population groups and locations were found to be resilient to extreme heat.

The authors of the study devised a mapping tool for WA, showing areas with various vulnerability and resilience levels to heatwave. This tool may assist in heatwave planning and targeting of vulnerable groups.

Cultural diversity within WA must also be considered so that heatwave information can be tailored to effectively communicate across the state, reaching all CaLD communities. The Department of Health website currently has heatwave fact sheets available in 17 languages other than English.



Heatwave impact based on composite scores of difference in age standardised rates between heatwave and non-heatwave days by LG area, November 2006 to April 2015³⁶

Source: Department of Health

HEATWAVE AND EMERGENCY MANAGEMENT

Heatwave has been recognised as a hazard within EM regulations since March 2012. The hazard management responsibility rests with the Chief Executive Officer of the Department of Health.

The [SHP Heatwave](#) was gazetted in October 2012, last activated in December 2019 and reviewed in May 2023. It was exercised in December 2018 with an additional Water Corporation heatwave workshop held in February 2019. The plan is inclusive and collaborative therefore there is high confidence in the plan being effective.

The plan outlines a multi-agency approach to the implementation of community resilience and education strategies. It promotes 'protect-in-place' with a strong focus on supporting vulnerable populations.

Surveillance

As part of their responsibilities, the Department of Health monitors:

- temperatures across summer (November to March)
- heat-related hospital attendances to emergency departments
- heat-related admissions
- statewide data analysis
- ambulance callouts.

The phases of activation are as follows:

- alert: forecast maximum 40°C or more for three days
- standby: forecast three-day average temperature (3DAT) $\geq 32^\circ\text{C}$
- response: commencement of 3DAT $\geq 32^\circ\text{C}$
- stand-down: 3DAT falls below 32°C.

In addition, the Department of Health is currently working with several LGs who have identified heatwave as a priority hazard for the purpose of developing risk assessments.

WHAT ABOUT CLIMATE CHANGE?

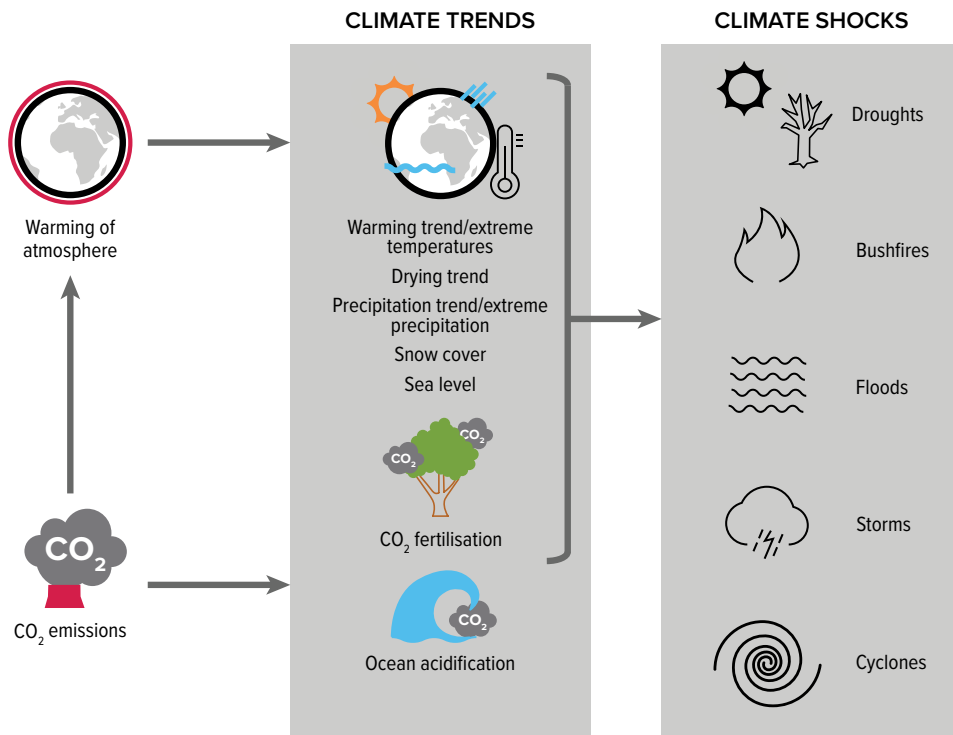
On 31 March 2019, the Minister for Health announced a statutory inquiry into the impacts of climate change on health in WA. The inquiry is reviewing the health system's capacity to respond to the effects of climate change and will make recommendations for improvement.

The inquiry officially started on 30 April 2019 and the final report is awaiting a formal government response. The state-focused inquiry included a call for written submissions, a number of public forums in metropolitan and regional areas, and a series of public hearings. It will address both mitigation and adaptation. The inquiry's final report will be published on the climate health [website](#).

Climate change: the facts

- **It is going to get hotter:** since the 1950s, each decade has been hotter than the previous one.³⁷ Between 2000 and 2016 human exposure to atmospheric warming in the three biggest Australian cities was on average about 0.9°C.³⁸
- **Our population is increasing:** The Australian Bureau of Statistics projects the population to grow by 29 per cent over the next two decades.³⁹
- **The population is ageing:** the number of people aged 65 years and over is predicted to rise by 91 per cent and those aged 85 and older to more than double.⁴⁰
- **The urban heat island effect** (the difference in temperature measured inside and outside the city) is increasing. With increasing urbanisation and high density housing comes a greater heat island effect.
- **Our dependence on air-conditioning and power usage** is increasing. People are increasingly living in homes not designed to reduce heat stress and more reliant on air-conditioning, the operation of which cannot be guaranteed during an extreme heat event.⁴¹

Australia's climate is getting hotter and more erratic and we can expect more extreme climate-related disasters such as heatwaves, droughts, fires and storms, as well as shifts in disease burdens.⁴²



Climate trends and climate shocks⁴³

Adapted from: Moody's Investors Service, Intergovernmental Panel on Climate Change

New climate change policy

The publication titled *Adapting to our changing climate* has been WA's climate policy since 2012. That policy drew upon the best knowledge at the time but does not reflect more recent advances in climate science and changes in national policy.

The state's energy-intensive, resource-based economy is particularly exposed to greenhouse gas policies and the impacts of climate change. Climate impacts in WA include:

- decreasing rainfall in parts of the state
- increasing extreme weather events, bushfires and coastal erosion
- changing patterns of disease, which can adversely affect primary industries, infrastructure, land and marine ecosystems and communities.

Ongoing uncertainty at the national level has made it challenging for states and territories to develop a considered response to climate change. The State Government has begun to take measures to ensure that we are well positioned into the future.

A proposed new climate policy will leverage the latest research and draw upon a number of climate-related initiatives already under way, including:

- measures to enhance renewable energy
- strategies to secure water supplies
- steps to accelerate the uptake of electric vehicles
- moves to unlock the state's significant carbon sequestration potential.

The Department of Water and Environmental Regulation's (DWER) Climate Change Unit has been coordinating the new policy. Tthe key issues facing WA in the transition to a resilient, low-carbon economy.

In September 2019 DWER released the *Climate change in Western Australia Issues Paper* that highlighted 11 focus areas that will help shape the State Climate Policy.

CONCLUSION

The EM sector needs to agree on a definition of heatwave and severity. A National Heatwave Working Group has been established to consider the national alignment for defining heatwaves. In addition, consideration is being given to the validity of using the Excess Heat Factor to measure heatwave intensity.

The current SHP Heatwave is metro centric and should be modified to become more relevant for the regions. We also need to raise awareness of the health effects of heat across government and non-government sectors and develop messages in diverse languages, including culturally appropriate versions.

The task of identifying and gaining access to those most vulnerable, including old and young people, outdoor workers, tourists and other vulnerable groups, must be prioritised. The collection of data, to measure the impact of heatwaves on people and evaluate any interventions, is critical.

There are significant opportunities to reduce our exposure to climate change-enhanced heatwaves in four realms:

- personal/community (e.g. through education and targeted health care of the vulnerable)
- workplace (e.g. changes in working hours, contingencies for work stoppages)
- buildings and infrastructure (e.g. house design, building regulations and construction standards)
- public realm (e.g. increased shading in public spaces).⁴⁴

“The dangers from extreme heat within Australia remain neglected, and fundamental changes will not take place until extreme heat is given the priority it deserves.”⁴⁵

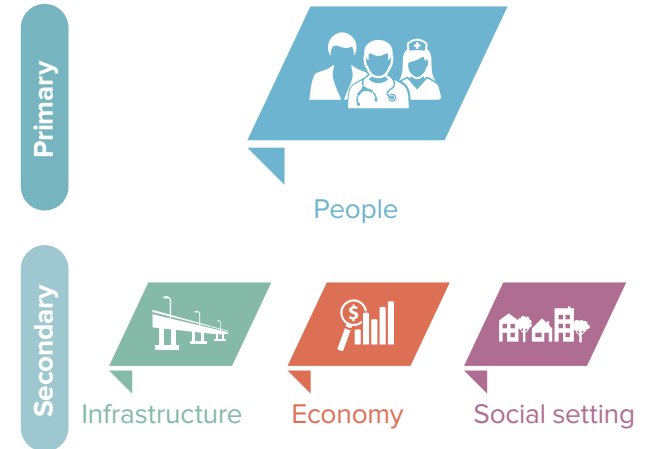
RELEVANCE

Heatwave is, now and has been for a long time, the number one cause of fatalities of all of emergency hazards in Australia. As such, the primary impact that heatwave causes upon the state core objective is on the category of people.

Heatwave may cause widespread disruptions impacting upon each of the other state core objectives slowing infrastructure, productivity and the economy and impacting the social setting. It is likely that there will be an increased frequency of heatwave events, associated with climate change.

In an EM sense heatwave is one of the most mature in terms of planning, preparation and messaging.

In a hot country like Australia, heatwaves remain poorly understood and typically underestimated. As long as this remains the case, heatwaves will likely continue to generate the most fatalities. Addressing this will remain an ongoing concern and an important aspect of the SEMC and sector’s engagement with the community.



A photograph of a sheep with thick, light brown wool, standing in a field of dry, golden-brown grass. The sheep is shown in profile, facing left. The background is a soft-focus field of similar grass. At the top of the page, there are several small, white, diagonal slash marks arranged in two rows.

CHAPTER 7

ANIMAL AND PLANT BIOSECURITY

07 ANIMAL AND PLANT BIOSECURITY

The agriculture and food sector in WA is a world-class producer of high-quality, safe agriculture, food and fibre products.⁴⁶ We are privileged to have one of the most pest-free and disease-free agricultural production areas in the world.

These factors, coupled with the high value placed on overseas markets, have made agriculture the state's second major exporter behind mining. The industry directly employs around 34,000 people⁴⁷ with numerous other sectors and industries heavily reliant upon their products and services.

The state exports around 80 per cent of its agricultural production (valued at \$8.5 billion in 2016/17). This represents one-quarter of the national (\$32 billion) agriculture export industry. Our continued access to export markets depends upon maintaining our biosecurity and reputation.

Biosecurity is the management of the risk of animal and plant pests and diseases entering, emerging, establishing or spreading in WA. Effective management protects our economy, environment and the community.

Biosecurity is a fundamental series of measures in place to protect this sector. It starts with the protection of Australia's borders at ports and airports through quarantine and inspection. It also seeks to prevent the introduction of exotic pests, diseases and weeds found in other states and territories. Beyond that, it includes the practices and habits that are employed on properties to reduce the risk of disease or infestation.

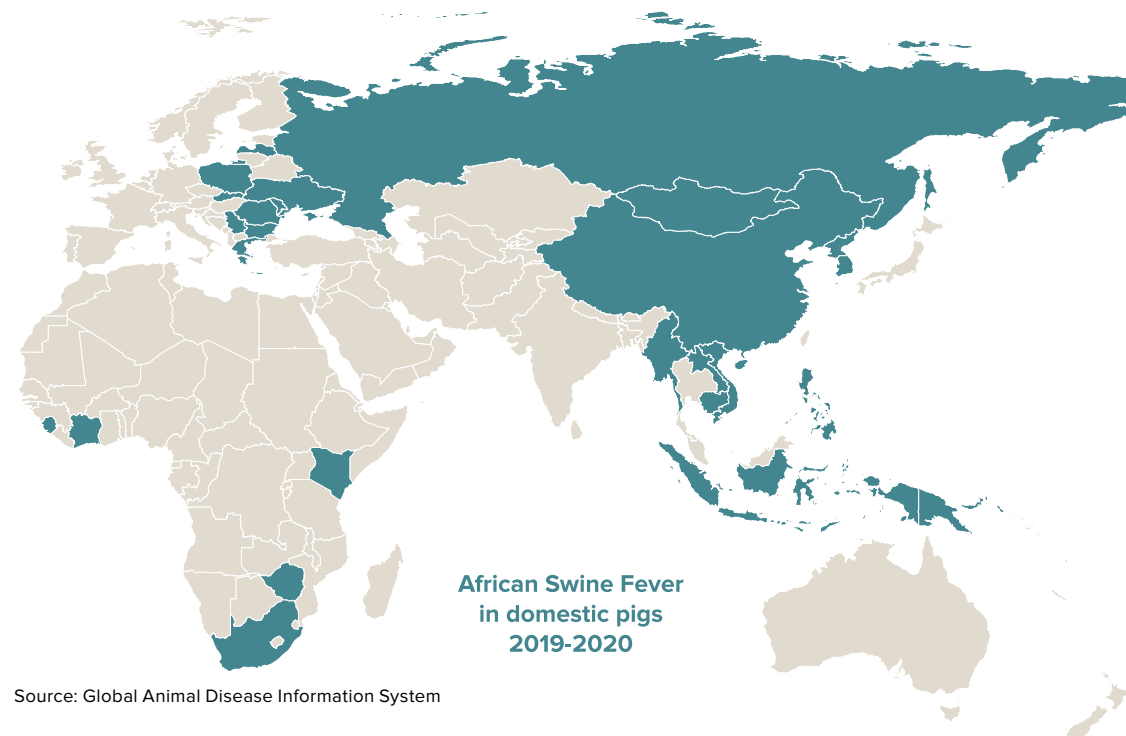
Although not commonly associated with emergencies, plant and animal pests and diseases are among the most significant threats to the state.

RECENT BIOSECURITY THREATS

Geographical isolation plays a key role in preventing the world's most severe pests and diseases from reaching our shores. But rapidly increasing international travel and trade is challenging this.

In the past year alone, Australia has had several close calls. While breaches do happen, Australia's biosecurity controls do work – most of the time.

The World Organisation for Animal Health has been tracking the spread of the highly contagious African Swine Fever (ASF) throughout 2019. This has occurred throughout the South East Asian region and as recently as 28 September 2019, was detected just 650 km away in Timor-Leste.



Source: Global Animal Disease Information System

ASF is a contagious viral disease of domestic and wild pigs. It has established itself in Asia and parts of Europe and continues to spread. ASF has no vaccine and kills about 80 per cent of the pigs it infects.

It was most recently reported in:

- Belgium, Slovakia and Serbia in Europe
- China, Mongolia, Vietnam, Laos, Cambodia, Myanmar, North Korea, South Korea, the Philippines, Timor Leste and Indonesia in Asia.

Government and industry have been implementing enhanced prevention and preparedness activities to provide the greatest chance of preventing its introduction into Australia.

In January 2019, the agricultural pest, brown marmorated stink bug, was detected on ships transporting vehicles to Australia. Our detection and surveillance regime enabled the ships to be turned around before they reached Australian territorial waters.⁴⁸ While this response delayed delivery of the vehicles, it also protected Australia from severe damage to agricultural crops.



In February 2017, tomato-potato psyllid (TPP) was detected in WA, the first Australian detection, prompting a comprehensive biosecurity response. TPP is a tiny sap-sucking insect that feeds on tomato, potato and other plants. It can affect plant growth, reduce crop yield and spread a serious plant disease. Department of Primary Industries and Regional Development (DPIRD) continues to work with the state's horticulture industry to minimise the impact of this pest.

Australia works across the whole biosecurity continuum with offshore, border and onshore measures. A range of sophisticated technologies and approaches is used to help prevent the introduction and spread of disease.

Surveillance and monitoring of risk areas is also critical, along with border control activities, which focus on assessing and managing potential biosecurity threats at Australia's airports, seaports and international mail centres.

Technology will play an increasing role in the fight against biosecurity threats. Advances may include better ways of tracking livestock, more effective vaccines, and better scanning and imaging devices to screen items entering the country.

POTENTIAL OUTBREAK SCENARIO

As discussed in Chapter 3, the following is an example of a scenario that agencies may use to develop and assess their planning for emergency events. The UK foot-and-mouth outbreak was used as reference point in developing the scenario, however it has been modelled to reflect WA and Australian numbers, conditions and context.

Scenario

A family returns from a holiday in Asia carrying some undeclared meat that escapes detection at the airport. They return to their semi-rural property and eventually feed leftover portions of the meat to their pigs – an illegal activity.

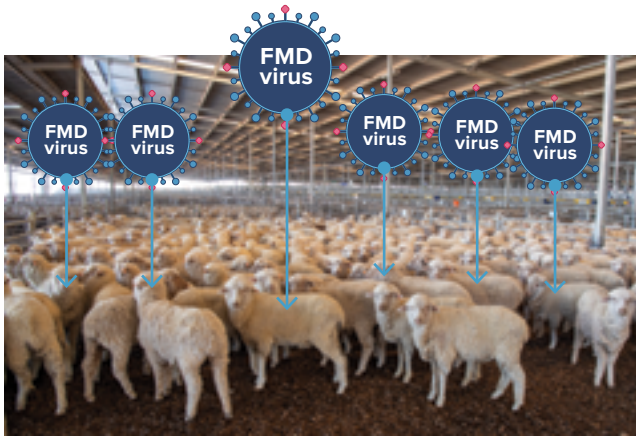
In this scenario, the meat contained traces of the foot-and-mouth disease (FMD) virus. This single act has now introduced this highly contagious disease into the WA livestock industry.

The pigs are kept in a paddock adjacent to two other small landholdings that run sheep. Some of these sheep become infected and are sent to market before they show signs of FMD. They spread the disease to sheep in adjacent pens that were subsequently bought and transported to rural properties.



One infected sheep at livestock centre...

Source: Department of Primary Industries and Regional Development



... leads to a flow-on effect, spreading the FMD virus throughout WA

Source: Department of Primary Industries and Regional Development

Each of these animals has been infected by FMD. They are yet to show any clinical signs but continue to spread the virus when they are purchased and transported across WA.

Only 10 days have passed since the family returned from their holiday. But from here, the rate of exposure and infection is exponential, particularly with some of the infected sheep mingling with sheep on a neighbouring commercial property.

On day 18, two hundred of these sheep – now exposed and infected – are transferred to a saleyard for sale. There they mingle with yet more livestock which are subsequently transported to numerous other properties, infecting cattle, sheep and other susceptible livestock across multiple WA shires.

All the while, the infected pigs continue to come into contact with other livestock.

This spread of the disease continues for another eight days before a producer in the south-west notices the first overt signs of the disease. His cattle are unwilling to eat and showing signs of increased salivation and slobbering.

By this time, the disease has infected an unknown number of animals on over 100 properties across numerous shires, stretching from Esperance to the Pilbara.

The international response is swift. Australia is subject to an immediate loss of access to export markets for FMD susceptible species. Even nations that are known to have FMD within their borders consider stopping imports. This has been seen recently with China suspending wool trade from South Africa following a FMD outbreak in 2019.⁴⁹ Ships already en route, transporting livestock and livestock products to other countries, are turned back.

Cloven hoof (susceptible) animal and animal product exports in WA constitute:

- two million head of beef cattle
- 14 million sheep and lambs
- 12 per cent of the national pig herd.

This was assessed to be worth \$2 billion in 2015/16. The cumulative loss from such an incident has been assessed to be significant.

Flow-on effects from the immediate loss of export markets are expected to include:

- Domestic sales of meat and other livestock products plunge under perceived public health concerns.
- Industries reliant on the livestock trade (transport companies, abattoirs and feed and produce stores) may face insolvency.
- The state's daily production of almost one million litres of milk is initially discarded as it cannot be transported for fear of further spreading the disease.

Having caused the loss of export markets, damaged confidence in local meat and livestock products and adversely impacting many associated sectors, the outbreak must now be dealt with.

THE RESPONSE

By the time this scenario had played out, over 300 properties in WA were found to be affected and required quarantine. Across Australia, upon first diagnosis of FMD, all movement and transport of susceptible livestock was subject to an immediate livestock standstill to halt the spread of the disease.

The resourcing required to deal with the livestock standstill was significant with hundreds of staff required in WA alone. This would immediately stretch the existing capacity of state agencies.



Livestock transport standstill across Australia

Source: Happy Auer

While national cost and resource sharing arrangements are in place, these would take some time to arrange and mobilise, especially as interstate agency staff would be diverted to help manage the standstill.

The steps and measures required to stamp out the virus are broad ranging. The first step will be to establish restricted and control areas to contain the disease and prevent any further spread. An extensive surveillance program will conduct 'trace forward' and 'trace back' analyses to determine the spread of the disease.

'Restricted' areas usually involve a 3 km radius buffer zone around any infected property and the 'control' area would initially involve the whole state as part of the livestock standstill and otherwise usually involves a minimum 10 km radius.

Infected animals in the restricted zones must be culled and high risk and infected properties must be decontaminated.

It is feasible that Australia would employ a targeted vaccination program to help stop the spread of the virus. Inoculating high risk or susceptible animals around the restricted area may form part of the vaccination strategy.

The resourcing required to deal with the outbreak is significant. It is estimated that up to 6000 personnel from a variety of industries would be required across the state.⁵⁰ These staffing projections include:

- surveillance of all properties holding susceptible species
- vaccination of uninfected livestock
- valuation of infected stock
- destruction and disposal of all livestock on infected and dangerous contact properties
- decontamination of infected and dangerous contact premises
- issuance of movement permits and regulation of movement controls.

Based on the natural progression of the articulated scenario in WA alone, an estimated 100,000 cattle, 780,000 sheep and many pigs and goats would have to be culled – over 1 million head of livestock. Additionally, boutique herds such as alpacas, camels, deer and llamas may also be affected.

Multiple teams would need to be deployed to destroy and dispose of this livestock across WA.



FMD response and surveillance requires thousands of personnel

Source: AFP

Current modelling suggests that in a single day the infected premises operations would be able to slaughter and dispose of:

- 250 cattle
- 1000 sheep
- 500 pigs.

The identification of suitable disposal methods and sites is incredibly complex and is explored in the emergency waste management section (Chapter 9).

Once all infected stock have been destroyed, each affected property must be decontaminated for the virus to be declared eradicated on an individual farm. A surveillance program would be required for Australia to demonstrate 'proof of freedom' from the disease.

This proof of freedom is the first step in being able to resume any international trade. The time from the initial outbreak to restoration of trade is likely to be over 12 months, during which time the livestock industry, its supporting industries and rural communities would be without markets and income. The social impacts are expected to be far reaching.

MANAGING THE RESPONSE

If a reportable disease is detected, states and territories are responsible for managing responses within their jurisdictions.

The Director General DPIRD, the HMA, is responsible for the coordination and management of response activities in accordance with the [SHP – Animal and Plant Biosecurity](#).⁵¹

The Australian Veterinary Emergency Plan (AUSVETPLAN) describes the nationally agreed approach for the response to an incident or suspected incident of an emergency animal disease in Australia.

At the highest level, incidents will require planning at national, state and territory, and district levels. They will also require the involvement of animal health authorities, livestock and affiliated industries, organisations in affected communities, and EM organisations.⁵²

The AUSVETPLAN documentation sets out nationally agreed roles, responsibilities, coordination arrangements, policies, strategies and procedures. It was developed and agreed upon to ensure that, if needed, a fast, efficient and effective response could be implemented consistently across Australia with minimal delay.

Recent international experience suggests that to effectively manage and eradicate an outbreak of FMD would take at least six months. Using that disaster information as a guide, and applying it to the WA and Australian contexts, it is estimated that an outbreak similar to our potential outbreak scenario would require thousands of response personnel across the state (and up to 20,000 nationally), both in the field and in laboratories. Over time many of these workers could likely be repurposed from some of the displaced and impacted industries (such as abattoirs and transport companies).

Local control centres for the widespread outbreak would need to be established in Broome, Karratha, Carnarvon, Geraldton, Northam, Merredin, Katanning, Bunbury, Albany and Esperance, with a State Coordination Centre in Perth.

DPIRD has already developed an incident management system to assist with the communication and coordination of operations.

Possibly, the most critical element of the response would be communications. The ability to rapidly get clear and actionable messages to the industry and the public would be vital. Such messaging can stop any further spread of the disease and minimise any panic among the population.

State and national structures exist to support the effective management of such incidents. For example, the State EM Plan enables the activation of structures including an Incident Support Group (ISG), Operational Area Support Group (OASG) and State Emergency Coordination Group (SECG).

Two of the greatest challenges to response will be the speed at which things will need to be done and sourcing the appropriate personnel and resources. The need to deliver a large-scale surge capacity will have costs, both financial and social, and especially to the wellbeing of those impacted.



Emergency response exercises are important to practice and evaluate preparedness

Source: Peter Caruso

RECOVERING

Until proof of freedom has been attained and restoration of trade is reinstated, the livestock industry, many rural communities and supporting industries will be without markets. This widespread impact is likely to result in farm insolvency and the closure of unviable support industries further affecting small communities, many of whom are reliant upon these.

The largest issues are expected to revolve around the social impacts that will be far reaching and long lasting. Typically this is the case following a major emergency. Mental health problems (suicides), fractured social networks, loss of community and permanent loss as farmers leave the land are all likely outcomes from a significant outbreak such as this scenario.

Even after the 12-month window before proof of freedom may be granted, there is no guarantee that markets will reopen to Australian products. Competitors will have been quick to fill the void that Australia left, increasing production and exports to meet demand. By the time that Australia is able to re-enter the market, that market may be gone.

The damage to some sectors may be irreversible and reputational damage to the nation's food industry may be irreparable.

COSTS

The 2001 FMD outbreak and subsequent eradication effort in the UK was the costliest outbreak to date – an estimated £8 billion (about \$A21 billion based on the 2001 exchange rate). The response took 221 days, during which time over 2000 infected premises were identified. At the peak of the outbreak, up to 50 new infected premises were identified each day and up to 90,000 animals were culled each week.

Countries without the disease, which include many of Australia's major trading partners, either do not import from FMD-infected countries or severely restrict imports.⁵³

The resultant loss of international trade in livestock and livestock products would be the most serious impact of an outbreak of FMD in Australia. The agricultural sector would face damage compounded by the ensuing effect to the WA economy.

With the agricultural industry representing 10 per cent of the state economy and 15 per cent of the national value of agricultural production, the flow-on effects would be significant.

A report compiled by the Department of Agriculture in 2013 examined the potential socio-economic impacts of an outbreak of FMD in Australia. The report identified that a large outbreak impacting multiple states would cost the nation \$16 billion in the first year and as much as \$52 billion dollars over 10 years. For WA it is estimated at \$1.5 billion in losses in the first year and as much as \$5.9 billion over 10 years.⁵⁴

With a large depopulation of livestock due to the disease, years would be required before the state reached pre-outbreak export figures again.

FMD does not raise any significant human health issues. However, this would not initially be understood or accepted. It is likely that consumption of red meat (including pork) would decline resulting in low prices and revenue losses in addition to the loss of export earnings.

THE REALITY

An outbreak of FMD has not been recorded in Australia for more than 140 years. But the disease is literally on our doorstep. FMD is endemic in China and mainland south-east Asia (Cambodia, Lao PDR, Peninsular Malaysia, Myanmar, Thailand and Vietnam), with regular reports of outbreaks.⁵⁵

Scenarios such as the one described above are used to test the state's capabilities and raise the awareness of stakeholders. These actions help agencies plan and prepare in advance.

FMD is but one of many biological threats to the nation. The national notifiable disease list includes 98 notifiable diseases for land (terrestrial) animals, and a further 52 for aquatic animals.

Our best defence against diseases such as this is for them not to enter the country. In addition to border biosecurity restrictions, the EM sector continues to collaborate, conduct horizon scans, risk assessments, exercises and research to understand the current and potential threats to our environment, and to minimise any potential impacts.⁵⁶

Understanding how the nation would manage an outbreak of FMD serves as a good indicator of Australia's general level of preparedness to cope with a range of other emergency animal diseases. As such, large bodies of work have been carried out around the likely impacts of an FMD outbreak and what the response might look like.

MORE THAN JUST A SCENARIO

In December 2018 and February 2019, the FMD virus was detected in meat products seized at two of Australia's international airports.⁵⁷ Had these slipped through, the above scenario may well have played out.

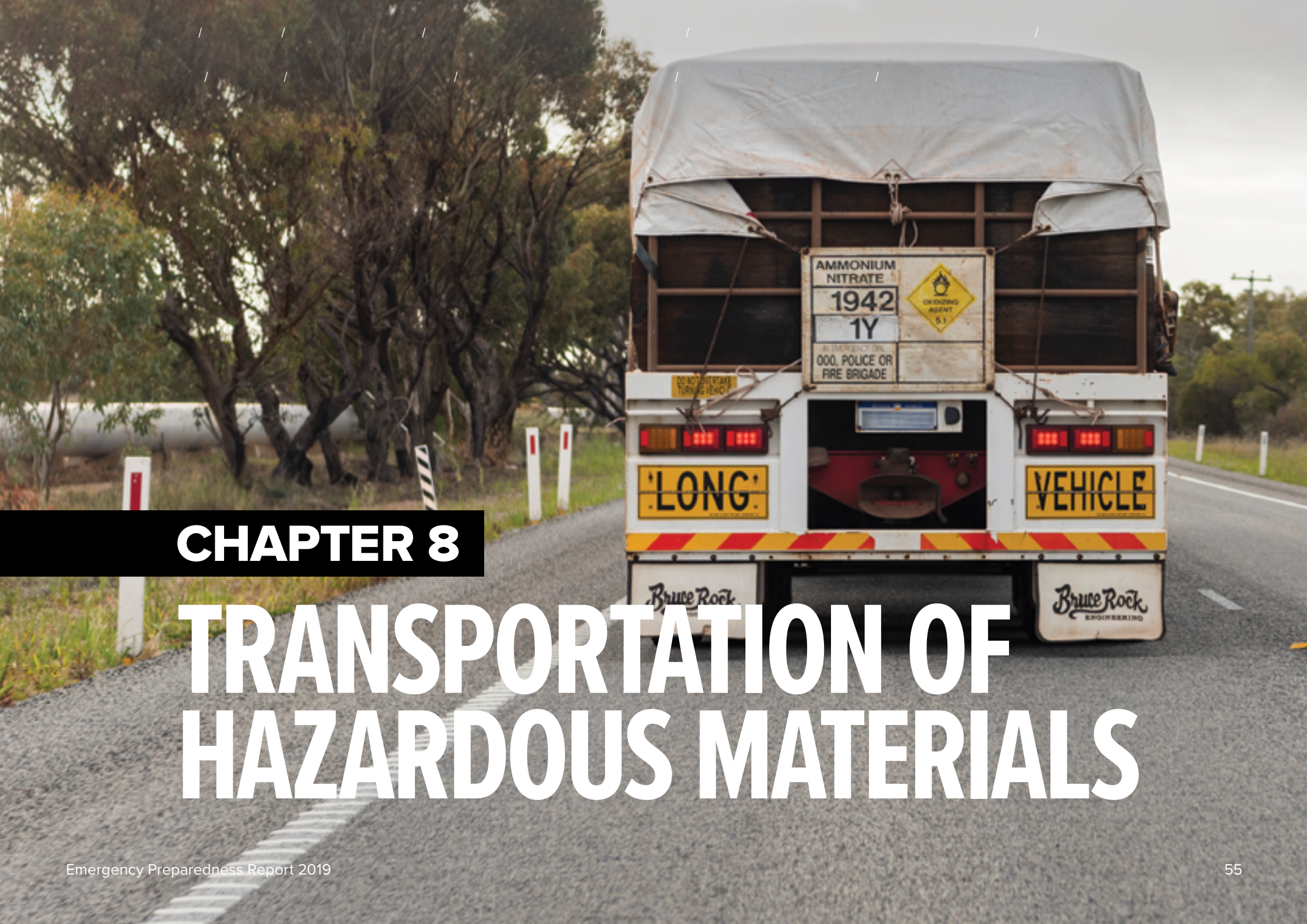
RELEVANCE

A biosecurity outbreak will do rapid and extreme damage to the economy both here and across the country. The flow on effects will greatly affect people, governance, environment and social settings.



The economic value of the agriculture industry in Australia is evident, but the sector is also a major part of the social fabric of Australia. Should major threats slip through the net, it is crucial that our organisational structures, coordinating arrangements, personnel and resource sharing agreements function properly. And that people with suitable training, expertise and awareness are in appropriate jobs.

There has been an understandable focus upon the hazards that we see often. But some of the lower likelihood hazards have very high consequences and as such can never be dismissed or ignored. The SEMC has a role as an all hazards coordinating body to ensure that hazards such as animal and plant biosecurity always remain on our preparedness radar.



CHAPTER 8

TRANSPORTATION OF HAZARDOUS MATERIALS

08 TRANSPORTATION OF HAZARDOUS MATERIALS

As a nation we rely on chemicals almost every day. They have become an integral part of our lives, sustaining many of our activities, helping us to control and prevent diseases, streamlining processes and increasing our agricultural productivity. They may be in paint for the walls, cleaning products, chlorine for our pools or any number of items that we use daily. While they may seem harmless, if they are not used properly, they have the potential to cause harm.

The chemistry industry is the second largest manufacturing sector in Australia, employing more than 60,000 people, with every one job creating five more within related supply chains. The industry contributes \$11.6 billion to Australia's gross domestic product, and supplies inputs to 109 of the country's 111 industries.⁵⁸

However, we cannot ignore that many of these chemicals may, if not properly used, have the potential to pose a danger to our health and poison our environment. Without proper attention, they may pollute the air we breathe, the water we drink, and the food we eat.

Acknowledging both the benefits and the inherent dangers, considerable efforts have been made to manage and control any likely adverse impacts.

DANGEROUS GOODS

Globally, the designation of a dangerous good is determined by the United Nations (UN). This consistency of definition allows for chemicals to be transported seamlessly by sea, air and land. The UN requirements are then incorporated into the *Australian Code for the Transport of Dangerous Goods by Road and Rail*⁵⁹ which flow through to the *WA Dangerous Goods Safety Act 2004*.

In order to allow the transport industry to operate Australia-wide the harmonisation of legislation is vital. Legislation, policies and guides have been created to govern anyone who stores, handles or transports dangerous goods or hazardous substances. The aim of this multi-tiered control is to minimise detrimental effects to human health and the environment by suggesting ways to control the risks of exposure.

To be of use, chemicals must either be manufactured locally or imported and then moved to where they are needed. The sheer volume of chemicals required and used each year means that the state's port facilities are critical to their receipt and distribution.

International



- United Nations codes & documents
- Imports
- Exports

National



- National transport code
- Interstate transport
- National transport companies
- Imports
- Exports

WA



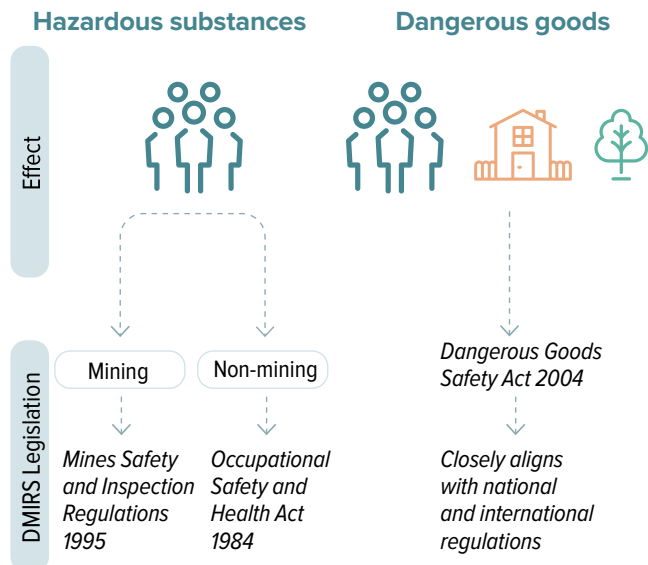
- DMIRS Act & Regulations
- Imports
- Exports

Link between WA, national and international transportation of dangerous goods legislation

CURRENT SITUATION

A range of different chemicals are used and transported in and around WA every day. These chemicals are classified as either dangerous goods or hazardous substances.

While the terms dangerous and hazardous may be used interchangeably, the distinction between them is important for their management and regulation. Dangerous goods are classified according to their immediate physical or chemical effects, such as fire, explosion, corrosion and poisoning. Hazardous substances are classified on their potential health effects.



Classification of dangerous goods



Dangerous goods classification symbols

Liquid petroleum gas (LPG) and fuel are the most obvious dangerous goods that are regularly encountered by the general public. However, dangerous goods and hazardous substances are ever present in most peoples' lives and are widely used in many industrial processes and workplaces.

Goods are generally moved around by truck, rail, ship and aircraft or, in some cases, piped directly to where they are needed. Most people are familiar with trucks and transporters displaying one or more of the symbols above. These symbols are used to quickly identify the class or division of dangerous goods.

WA has nine major ports where hazardous chemicals are received or distributed. These ports are located at:

- Albany
- Ashburton
- Broome
- Bunbury
- Dampier
- Esperance
- Fremantle (including the proposed Outer Harbour in Kwinana)
- Geraldton
- Port Hedland

These port facilities have the highest movement of dangerous goods in both number and volume. Importantly, and by design, they are also close to major infrastructure and large population centres. While proximity is excellent for commercial and efficiency reasons, it also means that many people and critical assets will be exposed to risk should something go wrong.

The table examines the degree of danger posed by a range of chemicals imported into WA and describes how often they are imported.

Degree of danger and transport frequency (qualitative) of the top hazardous dangerous goods in the Perth metropolitan area

Dangerous good	Degree of danger ^d	Transport frequency
Liquid petroleum gas (LPG)	High	Very frequently
Petrol	Medium	Very frequently
Ammonium nitrate	Low	Very frequently
Chlorine gas	High	Frequently
Sodium cyanide	High	Frequently
Ammonium nitrate emulsions	Medium	Frequently
Explosives	High	Rare
Hydrogen peroxide	High to medium (depending on concentration)	Rare
Ammonia gas	High	Very rare
Anhydrous hydrogen fluoride	High	Very rare
Xanthates	Medium to low	Very rare
Hydrogen sulphide	High	Never in bulk – occasional cylinders

^d The degree of danger is based on the UN Packing Group number. These groups are used to determine the level of protective packaging required to transport goods safely based on the good's danger. These are set by the UN to ensure consistency around the world.

WHAT COULD HAPPEN?

Assuming these chemicals are handled correctly, they are safe and pose very little threat. But accidents do happen, things are missed, people get careless, procedures aren't followed and, sometimes people are seeking to cause harm. Because of their toxicity, sensitivity or flammability, chemicals can potentially cause significant impacts on people, the community and the environment.

If these goods are maliciously interfered with or stored or transported incorrectly, they can pose a risk. The nature of this risk generally relates to the quantities being transported and the size of the container they are transported in.

Some of the biggest quantities transported include flammable and combustible liquids such as fuel and LPG (see table opposite). Fuel and gases are frequently transported in tanker trucks to service petrol stations in densely populated suburbs. Most other dangerous goods are transported to industrial areas for use or transfer to remote mine and industrial sites.

In the 10 years between 2008 and 2017, 146 transport incidents involving dangerous goods were reported to Department of Mines, Industry Regulation and Safety (DMIRS).⁶⁰ Over the same period, 241 storage and handling incidents were reported. The breakdown of the more serious incidents are shown opposite.

10

serious injuries from storage and handling incidents



2

fatalities from storage and handling incidents



1

serious injury from transport incidents



3

fatalities from transport incidents



Serious injuries and fatalities during storage or transportation

While rare, such incidents do occur. In 2013 a triple road train carrying 72 tonnes of ammonium nitrate crashed head on with a utility on the Great Northern Highway north of Wubin. The prime mover and lead trailer overturned, spilling ammonium nitrate and 2000 litres of diesel. The burning ammonium nitrate and diesel mixture produced a very hot fire that burnt for several hours, thankfully without detonation.

It is unknown why the mixture did not detonate. The detonation of this volume of chemical would have endangered witnesses and first responders and may have resulted in fatalities.

A similar incident occurred the following year in Queensland. On Friday, 5 September 2014, a truck carrying 53 tonnes of ammonium nitrate crashed 30 km south of Charleville in Queensland. The chemical was to be used to manufacture explosives at a mine site. The truck left the road and came to rest in a creek bed. The prime mover caught fire.



Top: Complete destruction of the Angellala Creek road bridge. Bottom: Damage to fire trucks as a result of the explosion

Police and fire personnel were in attendance when 78 minutes after the crash an explosion occurred. Minutes later, a second much larger explosion occurred. The truck transporting the ammonium nitrate, two fire trucks, a police car and both rail and road bridges over Angellala Creek were either destroyed or sustained significant structural damage. There were no fatalities; however, eight people were injured, some seriously.

In addition to providing content for the Australian Emergency Response Guide Book in 2018 for those responding to dangerous goods incidents, DMIRS produced specific guidance in 2019 for WA around the transportation of ammonium nitrate and explosives.

WHAT IS BEING DONE?

The risks associated with chemicals are well known, but the benefits they deliver far outweigh the risks, especially when these risks can be effectively managed and foreseeable issues can be appropriately mitigated.

Four schemes make up Australia's regulatory framework for chemicals. Each scheme focuses on controls of particular types of chemicals and their use. Each is managed by a different national authority.

- Importers and manufacturers of industrial chemicals:
 - National Industrial Chemicals Notification and Assessment Scheme (NICNAS)
- Pesticides, agricultural products, veterinary medicine, food for animals, pool sanitisers:

- Australian Pesticides and Veterinary Medicines Authority (APVMA)
- Medicines, medical devices, sterilants, disinfectants, primary sunscreens:
 - Therapeutic Goods Administration (TGA)
- Food for humans:
 - Food Standards Australia New Zealand (FSANZ).

The primary control mechanism in place for chemical safety is legislation and regulation. There are numerous Acts and regulations in place at national and state level that govern almost every aspect of their journey from importation through to use.

WA has seven pieces of safety legislation covering dangerous goods that relate to the manufacture, storage, possession, handling, transport and use of dangerous goods (both non-explosives and explosives).⁶¹ They include the operation of major hazard facilities across the state. The primary piece of legislation is the *Dangerous Goods Safety Act 2004* (the Act) administered by DMIRS.

The Act places responsibility on individuals to ensure that “all reasonably practicable measures (are taken) to minimise the risk to people, property and the environment from the goods”.

Regulations specify the legal and technical requirements for storing and transporting dangerous goods. In addition, the *Australian Code for the Transport of Dangerous Goods by Road and Rail Edition 7.6*⁶² imposes national requirements.

Risk assessments

As part of the SEMC's State Risk Project, a number of risk assessments involving hazardous materials (HAZMAT) scenarios were conducted at state, district and local level. All assessments resulted in high risks to people, the economy and public administration.

Recently, DFES conducted Exercise White Cloud that examined the movement of dangerous goods from Fremantle Port. DMIRS then linked up to develop a transportation plan that draws upon similar protocols used in Melbourne and outlines the processes to protect people and reduce impacts in the event of an incident.

It outlines multi-agency planning, response, preparedness and consequence management actions. The plan was successfully used in operation in May 2018. Other learnings from this HAZMAT scenario prompted the Department of Health to ensure they had sufficient medical supplies available for a potential incident.

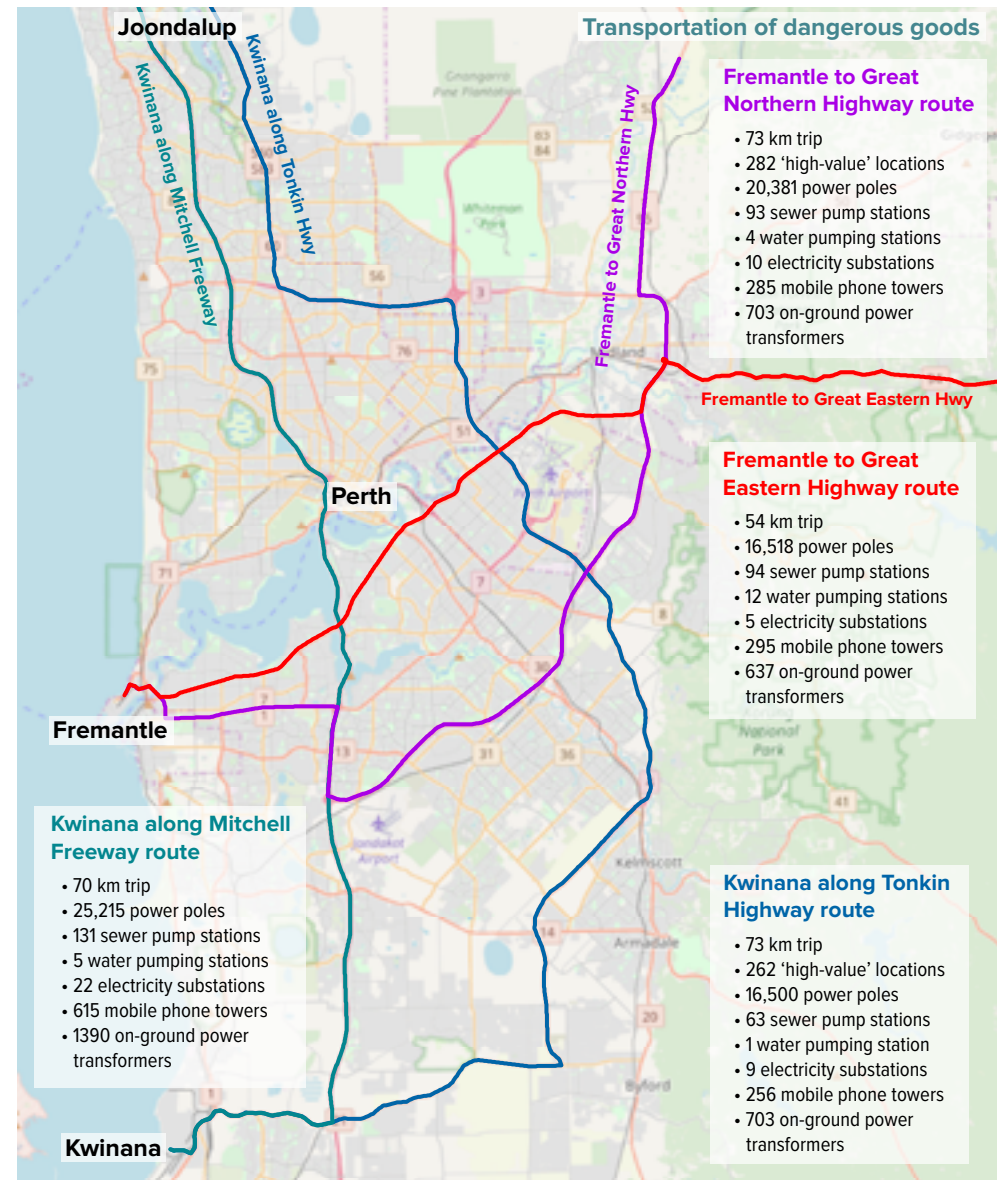
The Council of Australian Governments has identified 96 chemicals of security concern. Fifteen of those chemicals have been assessed as being particularly high risk and are subject to the voluntary *National Code of Practice for Chemicals of Security Concern*. Businesses that handle, manage or store any of these 96 chemicals are encouraged to adopt the code in relation to those chemicals.

Impact modelling

DFES has conducted detailed analyses of four transport routes that could be used to move dangerous goods from the ports of Fremantle and Kwinana for distribution north to the mineral resources sector.

The routes shown in the map are:

- Fremantle Port to Great Eastern Highway (red)
- Fremantle Port to Great Northern Highway (purple)
- Kwinana Port to Mitchell Freeway (green)
- Kwinana Port to Tonkin Highway (blue).



Map of four transport routes analysed for the movement of dangerous goods

The modelling examined potential impacts of an unplanned or accidental detonation of a load. The analyses assumed maximum fragmentation and a blast radius of 1 km.

Following any one of these routes, potential impacts were observed. They included impacts on:

- significant state infrastructure (hospitals and airports)
- high population areas (CBD)
- areas of particular sensitivity (schools, nursing homes, places of mass gathering)
- civically important institutions (Parliament House).

Understanding these potential impacts allows the EM sector to develop appropriate mitigation options. For example DMIRS has provided guidance aimed at limiting transportation of dangerous goods during peak times and avoiding places with high concentrations of people such as schools, shopping centres and hospitals. While these guides exist, SEMC has a low level of confidence that they are closely observed or enforced. DMIRS has noted that they confirm and verify routes that are taken as part of their product delivery.

Automatic vehicle location

Another control that is available but only sparingly used is automatic vehicle location (AVL). This is a means of determining and transmitting the geographic location of a vehicle in real time.

In 2004, a national licensing system was introduced, limiting access to security sensitive ammonium nitrate (SSAN) – ammonium nitrate that is of a high enough concentration to be used in explosives.

In WA, the transport of SSAN must be monitored. Companies do this at their own cost as part of their licence conditions. SSAN is the only chemical to have such conditions placed upon it.

AVL may prove to be a viable option for tracking and managing the transportation of other dangerous goods. Many larger transport companies already use AVL systems for fleet and health and safety management.

Main Roads WA uses the Intelligent Access Program (IAP)^e to monitor compliance of speed and routes by some prime movers for special access arrangements (e.g. road trains). However, this system does not track the vehicle and Main Roads only receives non-conformance reports.

WHAT ELSE COULD HELP?

As with most risks, there are a number of things that could be done in mitigation of transport risks and to improve safety. Unlike natural hazards, the actions that we choose to take to reduce the risk of transporting dangerous goods are largely within our control – but they do come at a cost. Some are relatively small, requiring minor changes to guides or regulations. Others, however, require significant buy-in from multiple levels of government and industry groups.



Truck carrying dangerous goods on the Kwinana Freeway

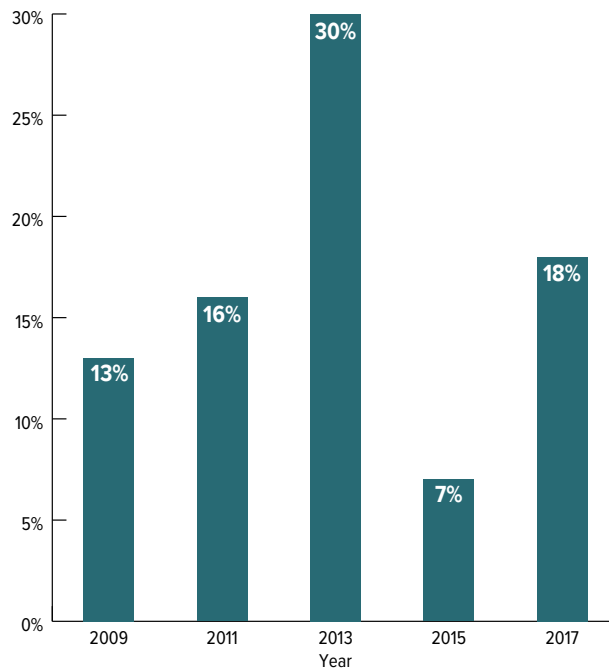
Source: Grant Wilson

^e Administered by Transport Certification Australia (TCA)
<https://www.tca.gov.au/>

Driver fatigue management

Legislated fatigue management for commercial vehicle drivers is already in place, regardless of the make-up of their load. Strict limits on driving times exist as a means of managing driver fatigue and reducing accidents. Given the potential ramifications of a dangerous goods vehicle accident, consideration could be given to strengthening these conditions for high risk loads.

Fatigue plays a significant role in heavy vehicle incidents in WA. Eighteen per cent of incidents in 2017 were a result of fatigue.



Percentage (%) of heavy vehicle incidents caused by fatigue in Western Australia⁶³

Some individual companies or businesses already employ their own fatigue management practices for dangerous goods drivers, restricting their drivers to between 10 and 12 hours of driving per day. However, this is by no mean the norm, nor is it compulsory.

Driver probity

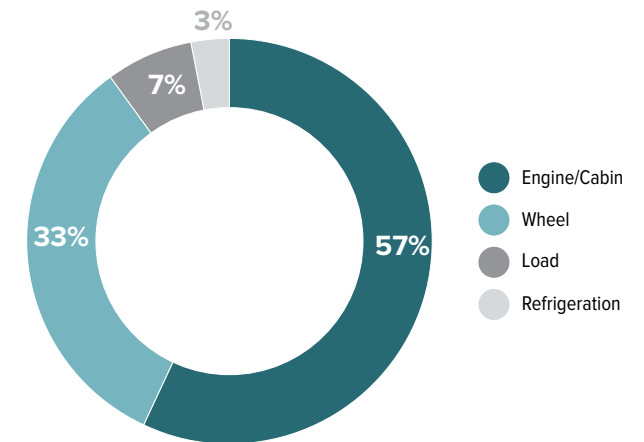
An element not currently in place is an adequate system of additional licencing or regulation of individual drivers for potentially high-risk loads. It is noted however that for some high-risk loads, such as explosives, drivers require specific licencing, security clearances and security plans to be in place.

All drivers carrying dangerous goods loads in WA are required to undertake specific dangerous goods training. For higher risk loads the driver is required to complete a DMIRS approved training course and be licenced appropriately, over and above their normal driver licence. More broadly applied probity examination for heavy vehicle drivers that deal with dangerous goods may prove beneficial.

Vehicle safety

Improvements in vehicle safety, particularly fire safety, could also reduce the risk of incidents. Statistics show that a high proportion of fires on heavy vehicles (33%) originate from a wheel fire (i.e. brake, bearing or tyre). The technical ability to monitor wheels for an increase in temperature or pressure may in time resolve this issue.

At present, dry powder extinguishers are required to be carried on heavy transport vehicles, but recent incidents have shown them to be ineffective for wheel fires.⁶⁴



Breakdown of the type of non-impact fires of heavy vehicle incidents⁶⁵

On 29 March 2016 near Tom Price hot wheel bearings caused a fire on a trailer carrying ammonium nitrate.⁶⁶ The driver was forced to disconnect the burning trailer and a 3 km radius area was evacuated.

The inclusion of foam extinguishers or a pressurised foam system for dangerous goods vehicles may alleviate this potential issue. DMIRS, through the national Competent Authorities Panel, has been seeking to increase the quantity of water/foam extinguishers carried on vehicles transporting dangerous goods. If the national agreement is unsuccessful, it is likely that WA will impose the measure on a unilateral level.

Another relatively simple solution to limit fire is rollover protection and battery isolation. Both of these systems could shut down the prime mover's engine and power sources, preventing electrical fires as a result of a crash or rollover.

Load monitoring

In responding to a crash, emergency services must receive accurate information about what dangerous goods are on a vehicle. At present, this information is physically located on the vehicle or trailer and can often be obscured or lost in an incident.

If an automatic alert system were to be combined with existing AVL technology, the location of every load could potentially be tracked and managed in real time. If an incident occurred, the contractor could be alerted, triggering their own internal emergency response procedures and, if required, alerting local emergency responders to the incident and type of dangerous goods involved.

A similar system was implemented in Singapore in 2005. The HAZMAT Transport Vehicle Tracking System (HTVTS) provides the location and speed of the vehicle, vehicle type and materials being transported. The vehicles have a specific route to follow which is decided based on an initial risk assessment.

In the case of an emergency (accidental or malicious), the HTVTS can trigger a range of safety features to limit harm. These include:

- 'limp' mode engages
- engine and ignition continue to run, ensuring power steering and brakes remain functional
- speed limiter forces slowdown and stop
- warning systems (horn and hazard lights) activate to warn other road users.

Legislative changes were required to make HTVTS compulsory in Singapore. The indicative cost for the HTVTS unit is \$3100, with annual maintenance costs around \$580. This cost is borne by individual companies and is a prerequisite before a dangerous goods transport licence can be issued.

Singapore is geographically small and faces different challenges from those experienced in WA. While their exposed population is potentially much higher, they do not have road trains and multi-trailers to contend with, or the more ready movement of vehicles across borders. The level of stringent control employed in Singapore would be less practical in places like WA.

Enforcement and compliance checks

Regular enforcement and compliance inspections of both drivers and vehicles already occur. Increasing the frequency of these inspections may increase compliance and further reduce the risk of an incident occurring. But locations where heavy vehicles can be inspected within the metropolitan area are greatly limited and these actions will come at a considerable cost. Options include:

- random rather than pre-planned inspections
- inspections conducted outside of business hours (at night time and on weekends).

Road design

Possibly the costliest option is that of enhanced road design for known high volume, high frequency or high risk dangerous goods routes.

Retrofitting existing roads and freeways with emergency lanes, laybys and enhanced access routes would be costly and disruptive of existing traffic flows.

More than just chemicals

Goods classed as infectious substances (including clinical waste) or radioactive are also dangerous goods and regulated by the Department of Water and Environmental Regulation, Department of Health (Environmental Health Directorate) and the Radiological Council of WA.

In 2017/18, there were 25,000 transactions of waste collected from 1914 premises. There were 33 licenced carriers (i.e. licenced to transport clinical waste) disposing of waste at 22 disposal sites, including landfills, an incinerator (Welshpool) and an autoclave (Bibra Lake), several waste transfer stations and two hazardous waste facilities.

The Radiological Council of WA estimates that about 10,000 transport movements of radioactive materials occur each year. Radioactive materials, excluding ores, are delivered and transported in custom-designed approved containers. Similar to other dangerous goods, transport regulations for radioactive materials in WA align closely with national and international regulations.

WHAT ARE THE CHALLENGES?

It should be noted that WA is at the forefront of Commonwealth efforts to harmonise explosives and security substance transport legislation and is a leader in the effort to harmonise and introduce safer transport through the *Australian Dangerous Goods Code*.

The greatest challenge is that incidents to date have been infrequent and have occurred in isolated areas. This means that the issue is not front of mind. The impact of an incident (like the explosion in Queensland) occurring in a densely populated area could be catastrophic.

The issue with assessing risk is that it 'trades off' consequence with likelihood. Because of this, mitigation options tend to be aimed at events that are most likely to occur and not necessarily those that would deliver the greatest consequence.

As outlined above, some possible mitigation options (such as road design) are prohibitively expensive. When considered against the historical frequency of events, upgrade expenditure would be difficult to justify and mitigation rarely goes beyond future replacement planning.

However unlikely an event may be, if an incident did transpire in a populated area, it would be catastrophic for those involved.

The world of dangerous goods transportation is complex and involves a range of stakeholders at state, national and international levels.

WA's size and remoteness poses a range of other challenges. Some of these include:

- Combination vehicles and road trains are regularly used and an AVL unit would be required on each trailer.
- Consideration needs to be given whether the load, the trailer or the vehicle need tracking. For example, tracking units for individual bags on a triple road train may be impractical.
- Containers and isotainers would need to have an AVL fitted before departure from port, which could delay port operations.
- Uses of transport vehicles may vary as a single vehicle, trailer or container may be used in many different roles.
- AVL signal reception may be limited in remote areas.
- The industry would have to bear the cost of tracking.
- It is common for dangerous goods in transit to remain on a ship while other goods are offloaded. Complexities might arise if an incident such as a spill or ship fire were to occur involving these dangerous goods.

The [SHP Hazardous materials emergencies \(HAZMAT\)](#)⁶⁷ is another control in place to offset the known risk. It uses a slightly broader definition than the *Dangerous Goods Safety Act 2004* as it includes chemical, biological or radiological substance, or any other substance. The hazard plan sets out the roles and responsibilities, and a range of prevention, preparedness, response and recovery activities to minimise the risk to people and the environment.

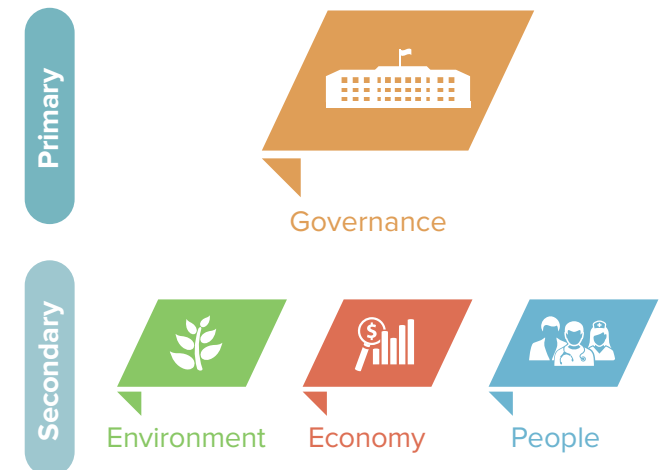
RELEVANCE

The transportation of dangerous goods is of most concern to the state core objective of governance with secondary flow on impacts to the economy, environment and people.

While the benefits derived from the use of these chemicals are evident, a perception of passive management and/or control may adversely impact on public confidence in the government to manage such complex issues.

Every day across WA hazardous chemicals are transported within and through our communities. The ramifications of an emergency could be dire. It is vital that all effort is made to coordinate the wide variety of control activities to ensure that the movement of these goods continues to benefit our economy without endangering our community.

On this issue the SEMC has been actively bringing stakeholders together to explore issues and to address any gaps or shortfalls.



A yellow CAT excavator is shown in the process of lifting a large, charred tree trunk. The scene is set on a paved road that has been affected by a fire, with blackened ground and charred trees in the background. The sky is blue with scattered white clouds. In the distance, several workers in high-visibility yellow vests are visible near other vehicles on the road.

CHAPTER 9

MANAGEMENT OF EMERGENCY WASTE

09 MANAGEMENT OF EMERGENCY WASTE

Almost without exception, emergencies leave large amounts of debris in their wake. Whether it be green waste from trees knocked down in a storm or cyclone, mud and sludge from flooding, asbestos when buildings are disrupted, firefighting run-off from a factory fire, contaminated soil from a HAZMAT spill, or animal carcasses after a biosecurity incident, there will be waste – and there will be a lot of it. And it will need to be dealt with quickly, safely and appropriately.

Dealing with the waste generated by an emergency can often be more complex and costly than the event itself. The priority must be to minimise human exposure to any hazardous or toxic material and to protect the environment from serious harm. The first phase tends to focus on the removal of debris that could cause an immediate threat to public safety (e.g. unstable structures, unblocking roads, loose asbestos and leaking chemicals). The second phase involves removing, treating and disposing of waste and debris in the longer term and site remediation.

Types of waste vary significantly and can change depending upon the hazard. In general, emergency waste is likely to include concrete or asphalt, metals, green waste, plastics, rock, building materials, glass, white goods, furniture, hazardous wastes (asbestos, paints, chemicals, fuels) and a range of personal belongings. Just as the types of waste vary, so do the strategies needed to deal with them.

Poor management of debris and waste in the aftermath of an emergency can hinder rescue efforts, severely impact health, increase costs and delay recovery. In a social sense, it is often the post-event effects and how well (or poorly) they are managed that draws the focus of the media, the community and formal inquiries. If managed well, these actions can instil trust. If not, public frustration and dissatisfaction will undermine trust, which, once lost can be difficult to get back.

The most significant example was the handling of the response to Hurricane Katrina in New Orleans in 2005. Delays in responding unnecessarily exacerbated suffering, drawing widespread criticism.

“Every home that was flooded (in New Orleans) had to be destroyed because it sat too long, too much mould and putrid water sat within them.”⁶⁸

The immediate recovery operation for Hurricane Katrina is said to have taken three years. While it has been almost 15 years since the event, the long-term recovery is not yet complete, and an estimated five years of work is still required.

EMERGENCY GREEN WASTE

Done well, emergency waste management delivers positive results. For example, in cyclone prone regions of Australia (Queensland, WA and the Northern Territory) green waste pick-up following an emergency has become the norm. Led primarily by LGs, the usual process is:

- Residents tidy the debris (tree branches, palm fronds and garden waste) from their properties.
- The green waste debris is placed on the verge or footpath of their property.
- LGs organise a street-by-street collection and a central processing location.
- In many cases, the green waste is mulched and made available for use on gardens (either free or for a nominal fee, if delivered).



Fallen trees after a hazard event

Source: Department of Fire and Emergency Services

This process rapidly deals with and breaks down large volumes of green waste, tidying the general area so as not to impede response efforts. It has the added benefits of providing mulch to beautify gardens and aid water retention, and of reducing the amount of solid waste required to go to landfill.

But even this simple and beneficial process comes at a large cost. The spread and volume of debris will make this clean-up a major logistical exercise. Entire fleets of trucks, heavy machinery, cranes, wood chippers and mulchers are required, along with the personnel needed to collect, process and distribute the green waste.

After a major hailstorm that hit the Perth region in 2010, large volumes of green waste and damaged vehicles resulted in costs of close to \$1 billion.



Clean-up work of affected properties after Hurricane Katrina

Source: Chuyin

The cost of handling the 27 million tonnes of waste generated by Hurricane Katrina in 2005 exceeded \$US4 billion and took more than three years to complete.

While these processes are not uncommon in cyclone prone areas, they are considerably less prevalent and certainly less practised further south, despite the fact that major storms can occur almost anywhere and deliver significant levels of debris.

Less frequently impacted LGs are unlikely to have well-developed plans and response arrangements. For less severe events, some LGs are known to implement programs that include:

- moratoriums on commercial rates
- free domestic green waste disposal
- issuing of a 'tip tag' or similar
- a threshold for free disposal of items.

For seasonal events, such as cyclones, some LGs implement pre-clean-up programs. These reduce the amount of debris that can become projectiles during the event, exacerbating damage. Darwin, Cairns, Townsville and Broome are examples of regions offering this service.

EMERGENCY SOLID WASTE

Events such as cyclones and earthquakes can wreak destruction – tearing roofs off homes, knocking down walls and generally creating large volumes of debris. For the most part, these items are not toxic but some materials can still pose a danger to responders or to people cleaning up in the aftermath.

The disposal of materials like construction waste (including timber, concrete, plasterboard, bricks, asbestos, vegetation, rock and soil) is less clear cut than it is for green waste. Normally construction and demolition waste can be separated for recycling (e.g. crushing concrete into drainage rock or road base) but during emergencies this type of waste is often sent to landfill sites. Landfill waste predominately falls into three main categories:

- household rubbish (destroyed and sodden furniture)
- commercial and industrial
- construction and demolition waste.

Landfill waste can take centuries to degrade, harm the environment and consume valuable space. This becomes potentially more challenging with the addition of emergency waste. The imperative to act quickly increases the likelihood of co-mingling of debris and reduces the amount likely to be recycled.

In WA alone, at least 15 Acts of parliament (and supporting regulations) relate to emergencies. There are:

- 8 government departments (and a further division of portfolios within these departments)
- 6 ministerial portfolios⁶⁹ and
- 137 LGs

that will inevitably be called upon to respond and service their communities.

Strict controls have been stipulated at national, state and local levels to ensure that all waste material is handled and disposed of appropriately.

The creation of ongoing management and subsequent repatriation of landfill sites across Australia is complex with numerous factors that need to be considered.

Considerable effort is made to ensure that the impact of landfill sites upon the environment and surrounding areas is minimised.

This is particularly challenging in the south-west with its sandy soils severely limiting where landfills can be sited due to the potential for toxins leaching into waterways and the environment.

Landfills mostly operate under the control of government environmental regulators. These control siting, design and operations, and classify the type of waste that can be received. They also require assurance that the site is filled and rehabilitated to an agreed landform and is monitored post-closure.

The process to identify and open a new landfill site typically will take several years. Sites are classified as to what waste they can accept based upon the surrounding soil and environmental conditions and potential impacts upon the environment. Importantly, the capacities of landfill sites are finite.

Landfill classifications and waste types

Class I	Inert	Unlined landfill for inert wastes
Class II	Putrescible (liable to decay)	Unlined landfill for putrescible and inert wastes
Class III	Putrescible	Lined landfill, which may include leachate collection, for putrescible and inert wastes
Class IV	Secure	Double-lined landfill with leachate collection for contaminated soils and sludges (including encapsulated wastes)
Class V	Intractable	Intractable wastes: <ul style="list-style-type: none"> • need time to break down • cannot readily be destroyed • do not have viable recycling, reuse or disposal options.

As with green waste, the major issues surrounding emergency solid waste disposal is in the:

- volume of debris likely to be created
- speed at which it must be dealt with
- limited number and proximity of approved sites
- size of the temporary workforce required
- impact on the lifespan of the landfill.

PROBLEM WASTE

Problem waste includes materials that have the potential to cause environmental damage or impact upon community health. They are either dangerous in themselves (asbestos) or contain potentially dangerous chemicals that may be released as they break down (gassed fridges). As a result, if not disposed of correctly, they can cause serious wide-ranging impacts. Problem waste can also include gas bottles, fire extinguishers, paint, batteries, oils, smoke detectors, heavy metals, car bodies, fluorescent lights and electronic waste.



Electrical items damaged by flood

Source: Nelis

Emergency incidents such as floods have the tendency to inundate large areas, submerging motors and other components of electronic items. Fridges, freezers, televisions, computers and monitors all have components that categorise them as problem waste. While they are not readily dangerous in their finished form, once disrupted they can pose issues.

Another concern with emergency waste following a flooding (or water) incident is the pollution generated by soils and sludge. Damaged sewage systems, flooded animal holding facilities and waste facilities creates a real risk of serious waterborne diseases.

HAZARDOUS WASTE

Hazardous waste management can be dangerous and requires much more caution. Hazardous wastes are prescribed in legislation and regulations. For the most part, they are toxic materials that are:

- explosive
- flammable liquids or solids
- toxic
- harmful to the environment
- infectious
- radioactive
- corrosive.

They can be by-products of legitimate industry or simply unlabelled items within a person's garage. They can be solid, liquid or gas, but importantly, they must not be disposed of conventionally.

BIOLOGICAL WASTE

While technically classified as hazardous waste, biological waste presents different challenges and must be managed separately from chemical waste. It is significantly present in waste from hospitals, universities and veterinary sites, sewage treatment facilities, medical waste plants, animal keeping facilities, and some industrial activities.

Many of the 28 hazards prescribed in legislation in WA have the potential to cause fatalities and mass casualties. This can greatly increase the production of waste that can include surgical wraps, laboratory equipment, syringes, needles, blood vials, absorbent material and swabs along with personal protective equipment.

In metropolitan settings, these items tend to be sterilised and rendered inert through the use of either an autoclave or an industrial furnace. In regional areas, they go to landfill but are especially geo-coded so that they are not inadvertently excavated in the future.

Fortunately, in recent times WA has not had an incident that has resulted in large-scale loss of life or created mass casualties. But these events are possible and must be prepared for.

ANIMAL CARCASSES

As outlined in the previous section, an animal biosecurity incident could result in the destruction of up to one million head of livestock. These carcasses must be disposed of quickly. In a large outbreak,

routine waste disposal techniques would be unlikely to be able to cope.

Improper carcass disposal can have a significant impact on environmental, human and animal health. It can result in contamination of soil, groundwater and waterways and allow disease to spread through scavengers, mosquitoes and vermin.

In the 2019 Queensland floods, more than 500,000 animals were killed, posing significant problems for disposal. These included the:

- spread of carcasses
- extended time since death, resulting in significant carcass decay
- difficulties in carcass handling due to advanced state of decay
- waterlogging of black soils, delaying movement of vehicles and machinery
- availability of excavation and transport machinery in the affected locations
- odour and disease concerns due to proximity to urban and residential areas
- potential water resource contamination, due to proximity of carcasses to dams and drainage lines.

Different disease outbreaks result in different types and amounts of waste and consequently different control measures are required. A variety of factors will affect the decision-making process and disposal method(s). These include the:

- epidemiology of the disease
- volume for disposal
- local access to disposal venues.

In a large-scale Australian outbreak, carcasses are likely to be disposed of through burial, composting or other means (rendering or alkaline hydrolysis). During the UK foot-and-mouth incident, the preferred method of disposal was burning. The expected volume of carcasses and fuel requirements make this solution unviable in an Australian context.

Regardless of the disposal method chosen, specialised, large-capacity transport vehicles that ensure biosecure loading will be required. It is likely that large mono-fill waste disposal facilities will need to be created. These are far harder to manage in the medium and long term due to odour, gas and leachate generation.⁷⁰

Beyond the sheer volume of carcasses to be disposed of, the major challenge will be the rapid identification and approval of disposal methods and sites.

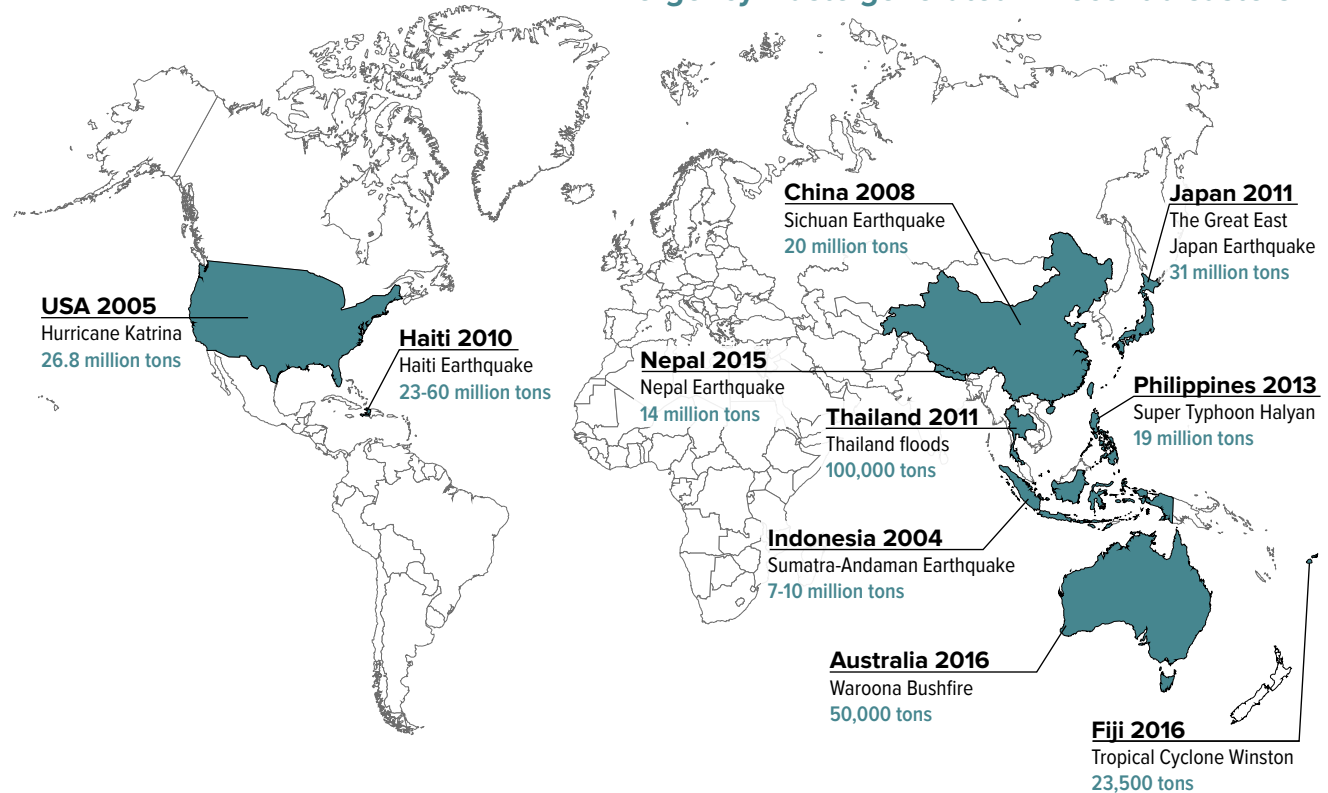
INTERNATIONAL EXAMPLES

There are no shortages of global examples from which lessons can be learnt. But the level of development and resources of the countries involved often greatly affect outcomes.

The 2010 Haiti earthquake is said to have killed as many as 250,000 people and resulted in the generation of as much as 60 million tonnes of debris.

The 2011 Great Eastern Japan earthquake and tsunami inundated areas along a 400 km stretch of coastline, killing almost 20,000. It overwhelmed existing local waste management facilities, in some cases generating the equivalent of as much as 103 years of waste.⁷¹

Emergency waste generated in recent disasters



Recent emergencies and the disaster waste generated⁷²

In August 2017, Hurricane Harvey struck Latin America and the Caribbean before intensifying and crossing into the US state of Texas and beyond. Extreme winds and a large storm surge contributed to the \$125 billion damage bill but the major factor was catastrophic rainfall-triggered flooding.

The enormous toll on individuals, businesses and public infrastructure should provide a wake-up call underlining the urgent need to ‘future proof’ the Gulf Coast — and indeed all of Texas — against future disasters.⁷³

Massive quantities of debris (10 million cubic metres) lay in Hurricane Harvey’s wake. Its disposal presented one of the most difficult problems ever faced by state and local jurisdictions. In some areas, debris disposal continued a full year after the storm.

Some of the key findings relating to debris and waste management following Hurricane Harvey included:

- While some local jurisdictions had debris management plans in place, they often proved inadequate.
- Pre-existing debris removal contracts had expired or were insufficient (or didn’t exist).
- The presence of debris fields contributed to mental health issues.
- Many landfills expected to operate for years began to fill up in only a few weeks.
- The need to create a catastrophic debris management plan and model guide for local use was identified.
- Issues surrounding the removal of ‘wet debris’ required further study.

Major emergencies can quickly overwhelm or eclipse the capacities of existing waste disposal sites. This is also applicable in WA in the context of the prescribed hazards. A major consideration must be the long lead time required to identify, assess, design and open a suitable landfill site. In the interests of emergency preparedness, this issue must be considered as a priority.

THE WAROONA BUSHFIRE

In January 2016, WA experienced one of the worst bushfires in recent history. A firestorm tore through the districts of Waroona and Harvey, triggering a large and long-term response and recovery effort. The clean-up was described as “the most complex in recent history” for WA,⁷⁴ presenting significant and devastating challenges to impacted communities.

The model of recovery adopted was based on previous major incidents, including the Parkerville and Roleystone fires.

The approach was also similar to those used in the 2009 Black Saturday fires in Victoria and the 2013 Blue Mountains bushfires in New South Wales.^f

Recovery required the removal of 50,000 tonnes of debris over the ensuing nine months. The discovery of asbestos and historical heavy metal contamination compounded the issue.

^f Following the Black Saturday fires of 2009 in Victoria all emergency waste was sent to landfill, despite nothing being tested for contamination.



Intermingled waste material after the Waroona bushfire

Source: Department of Fire and Emergency Services

The degree of contamination was significant, with fires spreading asbestos particles across public areas, private property, roads and critical infrastructure.

The clean-up operation needed to:

- remove debris and hazardous materials from public open spaces
- remediate destroyed residential properties to enable reconstruction
- inspect surviving residential properties and make them safe and fit for habitation (where required).

Before work could begin, the legal issue of having the appropriate authority to act arose. Those seeking to action the clean-up had to obtain permissions and authorisations to enter and deal with the properties concerned. This not only involved the property owners but also tenants who had to agree to allow for their remaining items to be managed by the state. Challenges included:

- many property owners had dispersed widely (including interstate)
- several property owners refused entry, impeding clean-up on those sites.

A major issue identified was that existing government processes were too prescriptive and required improvement to enable a flexible and timely response. For example, traditional government procurement procedures hampered the rapid identification and engagement of appropriate contractors to carry out much of the clean-up. It was vital that those companies involved were accredited and reputable to ensure that waste was dealt with appropriately.

Similarly, given the volume of waste created and the costs of transportation to an appropriate site, consideration was given to opening a new landfill site. However, if built, Australian Government recovery funding criterion would have required that it only be used for the clean-up of that emergency – it would then need to be sealed, never to be used again. This was not feasible for future long-term management of the area's waste.

The choice of whether to separate and segregate at source was broadly considered. However, the extent of asbestos contamination and the discovery of legacy contaminants resulted in all debris being sent to landfill, with nothing being recycled. While costly, it was deemed safer, quicker and potentially less expensive overall to merely remove the topsoil and replace it.

The decision not to recycle was not taken lightly. But public health and speed of community recovery took precedence. By the end of August 2016, this phase had been largely completed, costing the government(s) about \$25 million – just for the clean-up⁷⁵ (a sum that does not include costs to private individuals and insurance companies).

Given that the lessons learnt from the 2016 event are likely to inform future events, there is a good chance that landfill will remain the primary method for stabilising future emergency waste.

LOOKING FORWARD

Emergencies present a considerable range of waste management challenges to the state.

Until recently, disposal of waste tended to be considered only after an event. Various hazard scenarios tended to focus on the response phase with little consideration to recovery.

Like the emergencies themselves, effectively managing waste is complex. It has the potential to be the trigger for a much larger emergency event or can impede response and recovery efforts.

We already know the value in planning for emergencies. Failure to think through, plan and prepare prior to an event is likely to result in reactive actions during and after an emergency. Given the complexity involved in dealing with emergency waste, this is clearly an area for pre-emptive action.

Recent research has found that waste management is rarely mentioned in local EM arrangements. Indeed, a 2018 survey found that less than one-quarter of LGs had assessed the type and volume of waste that could be generated from any of the prescribed hazards.

An even lower proportion had communication strategies in their recovery plans for dealing with the waste that may be generated.⁷⁶ Further, of those that did refer to waste management, the focus was narrow. They only considered asbestos, access to existing providers and consideration of how facilities would operate or be affected.⁷⁷

While each of the 28 prescribed hazards is assigned to a specific HMA, responsibility for managing waste generated from emergencies falls to a variety of agencies. As such, it is vital that clear EM waste management arrangements are in place for when emergencies occur.

Internationally, it has been found that LGs with a pre-emergency waste management plan manage clean-ups better. They recycle almost twice as much disaster debris, receive significantly more funding from government sources, and remove more cubic yards of debris per day compared to those without plans.⁷⁸



The understandably strict compliance measures associated with securing suitable landfill sites mean that responding swiftly to emergency waste can be difficult. Despite the individual complexities of any given event, the steps involved are relatively systematic. As such, at least some parts of the process can be planned in advance of an event.

The reality is that waste management requires long-term, ongoing planning. Approvals and licensing take time to achieve. Factoring in planning for sudden onset events with unknown timing, intensities and impacts is a challenge. But it is one that must be considered.

The Western Australian Local Government Association (WALGA) has worked with the State Government to develop a list of companies capable of cleaning up hazardous materials and has circulated it to LGs. This addresses one of the many issues associated with waste disposal following an emergency.

Better emergency waste planning also provides potential to inform preparedness. A better understanding of emergency waste may enhance resilience and reduce the vulnerability of communities.

A POSSIBLE FUTURE

A number of countries (Germany, Switzerland, Sweden, the Netherlands, Austria, Belgium, Denmark and Norway) have virtually eliminated the need for landfills, with 3 per cent or less of their waste finding their way to landfill. Australia currently puts an estimated 40 per cent of its waste into landfill.

Recent post-emergency clean-up in Australia has seen virtually none of the resultant debris being recycled.

Better planning about waste matters prior to an emergency event may allow for an increase in recycling and the maintenance of value in the system. In a non-emergency context, this has already commenced.

DPIRD has published a report⁷⁹ examining the three main technologies used around the world to convert biomass waste to energy. These include:

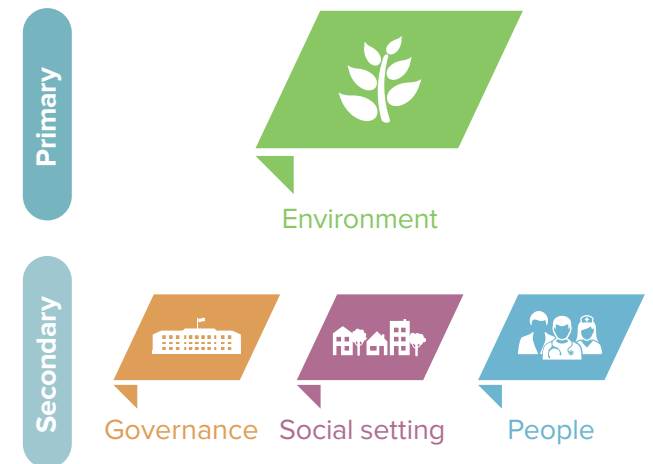
- combustion, gasification and pyrolysis
- second generation ethanol production
- anaerobic digestion.

Organic waste, when broken down by bacteria, produces a methane-rich 'biogas' that can be used to generate electricity and heat. Water treatment facilities in Sydney and Melbourne are already using sewage as their biogas feedstock, converting it to electricity. WA's Water Corporation is building a similar plant in Craigie that is expected to be completed in 2020.

Such technologies can be used in the future to increase energy efficiency and provide options to deal with emergency waste. These long-term solutions require further consideration.

RELEVANCE

The management of emergency waste following an emergency has been determined to most affect the state core objective of the environment. Secondary impacts would be felt in the governance, social setting and people core objectives.



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If large volumes of waste were not managed quickly, effectively and appropriately it can cause contamination to the environment. This may lead to public outrage and condemnations of mismanagement (as was seen following Hurricane Katrina).

As with all of the highlighted examples, other state core objectives are also likely to be impacted. The people, environment and faith in government and its agencies may be affected.

Dealing with emergency waste is a complex matter. Large volumes of emergency waste can quickly overwhelm existing capacities and challenge our capabilities. The processes to identify, ratify and build alternate sites, in a manner that will maintain our strict environmental protection imperatives, is a lengthy one.

Emergencies and natural hazards are inevitable and so too is the generation of large quantities of waste. These factors combine to highlight the importance of forward thinking, planning and preventative action.

The matter of emergency waste has been a matter of ongoing focus since at least 2016. Projects have examined the issue, identified best practice and developed a path forward. The SEMC will seek to capitalise on what has already been done bringing agencies together to address this issue.



CHAPTER 10

**ADDRESSING COASTAL
HAZARDS IN PARTNERSHIP**

10 ADDRESSING COASTAL HAZARDS IN PARTNERSHIP

WA has a vast coastline that extends (including islands) for more than 20,000 km.⁸⁰ Over time, dynamic interactions have shaped the shoreline and created the distinctive landforms that characterise the coast. Our unique coastline features varied geology and diverse marine, wetland and estuarine environments, which have been globally recognised for their biodiversity and ecological value.⁸¹

An estimated 80 per cent of Australians live within coastal catchment areas.⁸² Around 80 per cent of the state's tourism activity also occurs in the coastal zone.⁸³ Coastal and ocean activities, such as maritime transportation of goods, offshore energy drilling, resource extraction and fish cultivation are all integral to the state and national economies.

But the Australian coastline remains exposed and susceptible to a range of hazards. Cyclones, storm surges, tsunamis and other extreme weather events can all threaten our coastline and pose risks that could impact our people, economy and way of life.

Our decisions to develop cities and towns, infrastructure and industry close to the shoreline continues to impact the coastal environment. While state planning policies require consideration of coastal hazards in any new coastal developments to avoid creating any further vulnerabilities, many towns, people and assets are already in harm's way.

The highest population densities occur across the Perth metropolitan, Peel and the South West regions.

These areas are also earmarked for significant urban growth to accommodate a population increase of up to 1.5 million people by 2050.⁸⁴

Beyond the shocks that natural hazards can deliver, our coastal environments are already vulnerable to coastal erosion and inundation.⁸⁵ This is particularly the case for those environments characterised by open, low lying and soft sandy beaches, dunes and coastal terraces. It is however important to note that coastal erosion in isolation is not a disaster event.

CURRENT SITUATION

In WA, extreme weather events, high intensity storms and heavy rainfall are regular events. Global warming, climate change and sea level rise are expected to combine to increase both the frequency and severity of such events. Projections suggest that tropical cyclones will move further southward, affecting areas not previously impacted.⁸⁶ Changing sea levels, climate and erosion patterns have seen significant portions of territory already reclaimed by the ocean.

The incidence of coastal erosion, while serious, and potentially damaging to the economy and ecosystem and environment is not classified for EM purposes as an emergency event. It can however be exacerbated by several events that are.

Much of the state's urban settlement was planned and developed in an era that did not foresee the impacts that climate change is delivering today. This has left a legacy of exposure to coastal hazards when confronted with modern realities. Properties and infrastructure have been placed in areas that have become increasingly vulnerable to hazards, and were not built to a standard that reflects changing coastal conditions.⁸⁷ Coastal erosion and inundation from sea level rise now poses a significant risk to coastal WA.

COASTAL HAZARDS

Concern over coastal erosion and inundation has been growing and recent events have delivered visible impacts of the loss of coastal lands in a number of parts of WA. Graphic images of eroded beaches have prompted calls for action by the media and members of the community. But in reality, the issue has been one of national, state and LG concern for decades.

Coastal erosion is a natural process that occurs when the removal of material away from the shoreline is greater than any new deposits. It can occur suddenly as a result of a large storm or be more gradual over time. Many coastal landforms naturally experience this in quasi-periodic cycles of erosion and accretion on time-scales of days to years.⁸⁸ Coastal erosion can also occur quite suddenly as a result of a large storm or a series of storm events.

Both slow and rapid erosion can cause shoreline recession creating a hazard for coastal environments, particularly if actions are not taken to moderate, or adapt to, the potential impacts.

Human activities can strongly influence the propensity of landforms to erode. The construction of coastal structures (such as breakwaters, groynes and seawalls) can lead to changes in coastal sediment transport pathways, resulting in erosion in some areas and accretion in others.⁸⁹

Sea level rise is also increasing the risk of coastal inundation in WA, a process where seawater floods the land. It is predicted that even a 0.5 metre rise in sea level could result in a current 1 in 100-year event occurring in Fremantle on a monthly basis by 2100.

As the coast erodes and seawater saturates the sand, the strength of the ground can be compromised. This instability can increase the risk of landslides and structural collapse of the property and adjacent infrastructure.⁹⁰

Further, as coastal dune systems are degraded, their ability to function as a natural buffer zone, protecting the land against the impacts of storm surge and flooding, is undermined.⁹¹

RECOGNISING THE RISKS

The value of coastal lands and their inherent sensitivity to change have been officially recognised in planning considerations since at least 2003 (through State Planning Policy 2.6: State Coastal Planning).

In 2005, a major study⁹² into natural hazards in the greater Perth region identified that the coastline between Bunbury and Mandurah was highly susceptible to coastal erosion. Of notable concern was the finding that the same area also had the fastest population growth predicted.

In 2009, the Australian Government conducted a national assessment of the climate change risks to coastal areas. The aim was to identify areas most at risk of hazards exacerbated by climate change. It determined key priority areas requiring coastal adaptation investment.

The assessment determined that up to 29,000 residential properties in WA could be at risk of inundation. This assessment used the prediction of a 1.1 metre sea level rise within the century. The replacement cost of these properties was estimated (at the time) at \$5–8 billion.⁹³ The study also revealed that the area between Cape Naturaliste and Bunbury would be affected by coastal erosion as a result of incremental sea level rise. More specifically, the assessment determined that Mandurah, Rockingham and Bunbury together represented more than 60 per cent of the state's total residential properties at risk.

During this time, influential coastal science research was progressing both nationally⁹⁴ and in WA⁹⁵ in developing a coastal classification system. The system incorporated sediment flows, geological features and landforms and formed the basis of a regional framework for coastal management. A key element was the acceptance that changes imposed at one part of a coastal system were likely to affect another. As nature has no regard for jurisdictional boundaries, an integrated, regional approach was vital.⁹⁶

THE IMPORTANCE OF LOCAL GOVERNMENT

LGs have a critical role in minimising the impacts of coastal hazards. Their statutory responsibilities include:

- environmental protection
- public health and safety
- community asset protection
- economic development.

State planning policies (SPPs) clearly stipulate the requirements for LGs to consider when making land use planning decisions.

LGs (as the closest form of government to the community) are required to comply with legislation, plans and policies from a wide variety of sources. Despite this breadth of responsibility, some of the smaller areas may be limited by a lack of financial resources, knowledge and expertise.

Further, the measures that one LG may implement to address a local coastal hazard issue may, in fact, have negative implications for a neighbouring LG area.

Noting the many competing pressures on the coast, the State Government has developed the WA Coastal Zone Strategy. This provides a whole-of-government integrated framework for collective action to manage and adapt to threats and pressures along our coast.

The Strategy emphasises that all levels of government, private organisations, natural resource management groups, the community and individuals each play an important role in coastal planning and management.

Integrated framework for coastal planning and management⁹⁷

Environment	Conserve the state’s natural coastal values and assets through sustainable use.
<i>Key Objectives:</i>	<i>Protect, conserve, enhance and maintain natural coastal values.</i>
Community	Ensure safe public access to the coast and involve the community in coastal planning and management activities.
<i>Key Objectives:</i>	<i>Ensure public ownership of coastal and estuarine foreshore reserves for management, safe public access, recreation and conservation.</i>
Economy	Provide for the sustainable use of natural coastal resources.
<i>Key Objectives:</i>	<i>Ensure natural coastal resources are used in an equitable and sustainable manner.</i>
Infrastructure	Ensure the location of facilities and infrastructure in the coastal zone is sustainable and suitable.
<i>Key Objectives:</i>	<i>Locate and design coastal development, infrastructure and facilities taking into account coastal processes, landform stability, water quality, environmental flows, hydrological cycles, coastal hazards and climate change.</i>
Governance	Build community confidence in coastal planning and management.
<i>Key Objectives:</i>	<i>Align policy, planning and development in the coastal zone with the public interest.</i>

PERON NATURALISTE PARTNERSHIP

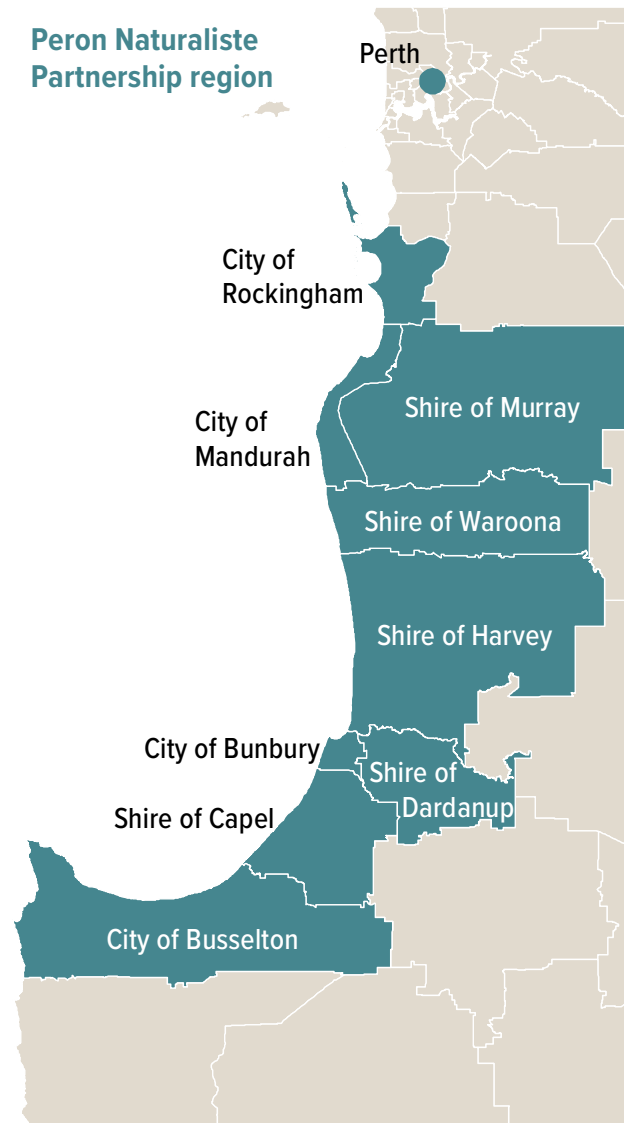
Following research during the first decade of the 2000s, in 2011 nine affected LGs united to form the Peron Naturaliste Partnership (PNP). The first of its kind, this partnership sought to gain a deeper insight into the impacts that could result from sea level rise, coastal erosion and inundation in their respective communities.

The members were the cities of Bunbury, Busselton, Mandurah and Rockingham, and the shires of Capel, Dardanup, Harvey, Murray and Waroona. They initiated a regional adaptation response to climate change, reducing the impact of coastal hazards to life, property and the local environment.⁹⁸ The PNP agreed that:

- Climate change had no boundaries.
- The stretch of coastline to be impacted was highly valued.
- The impacts of climate change would have regional and global implications.
- LGs needed to adopt a coordinated and collaborative approach to address climate change.
- A regional partnership would enable the resource and information sharing necessary to build capacity.

The group agreed on several best practice principles that would guide their work in the region.

Leveraging scientific research and existing data, the PNP embarked on a journey that sought to identify and minimise risk in a way that considered various (and often competing) coastal uses and values.



The PNP's first project in 2011 was to conduct hazard mapping to identify areas vulnerable to erosion and flooding up to the year 2110.⁹⁹ The research determined that erosion threatened a 200 metre-wide strip of coastline and that 800 hectares of residential land was vulnerable to inundation.

Based on these findings, the total value of assets at risk from coastal hazards in the region was \$1.2 billion. The cost of mitigating these risks was estimated at \$120 million.

This project laid the foundation for the PNP's future initiatives by identifying key priorities and potential adaptation pathways. The project also highlighted a need to disseminate findings more widely and to engage the whole community as key stakeholders and coastal stewards.



Aerial view of coastal development in Mandurah

Source: Peron Naturaliste Partnership

Characteristics of the region

The area concerned is a 212 kilometre stretch between Cape Peron and Cape Naturaliste. Half of the coastline has been urbanised with residential and commercial land-uses interspersed with recreational areas.¹⁰⁰

The Peron Naturaliste region encompasses nine LGs responsible for the safety of a population of 360,000 spread over four major and rapidly growing centres and numerous smaller towns in the south-west.

The area between Cape Peron (Rockingham) and Cape Naturaliste (near Dunsborough) is characterised by open sandy, low lying coast bounded by two rocky points. It encompasses large estuarine systems that influence coastal dynamics and serve as a natural buffer.

Within the region are environmentally protected areas. Threatened ecological communities and species have also been identified.¹⁰¹

The region also includes cultural and spiritual sites for the traditional Indigenous people, the Noongar people.¹⁰²

The coastal strip is revered for its recreational possibilities, and tourism is a drawcard and major economic industry for the PNP region.¹⁰³

COMMUNITY ENGAGEMENT

Drawing upon research, a community awareness program was developed in 2013 to increase awareness of coastal hazards. It also sought to identify opportunities for community involvement to build resilience.

Building on this, the PNP later initiated a project to gain an understanding of what communities valued about the coastline and how this could be impacted by either climate change or any potential adaptation measures chosen.

The PNP conceived an overarching vision to: empower a resilient regional community to reduce risks and optimise opportunities presented by climate change.

PNP follows best practice standards informing, consulting, involving, collaborating, and empowering their communities.¹⁰⁴ A range of workshops, coastal surveys, participatory scenario planning and cultural mapping workshops were held to determine values.



Sign at the beach inviting the community to participate in the coastal survey in Bunbury

Source: Peron Naturaliste Partnership

REGIONAL COASTAL MONITORING

In order to monitor long term changes to the coastline, the PNP initiated a standardised, coastal monitoring program in 2014. It has since been providing region-wide data to inform decisions regarding ongoing coastal management and adaptation.¹⁰⁵

The PNP, in collaboration with The University of Western Australia, employs a variety of tools and techniques to collect standardised data across the region, including:

- monthly beach width measurements
- photographic surveys
- dune migration rates
- oblique aerial surveys
- flood frequency records
- inundation extent.

This monitoring allows PNP members to understand the behaviour of the coast and the ways in which it is changing. This informs both current coastal management and future planning by providing baseline and longitudinal data.

COASTAL HAZARDS RISK MANAGEMENT AND ADAPTATION PLANNING

Land-use planning plays a critical role in reducing the risk of both natural and coastal hazards.¹⁰⁶ Under the SPP 2.6 individual coastal LGs in WA must undertake coastal hazard planning in accordance with the *Coastal Hazard Risk Management and Adaptation Planning (CHRMAP) Guidelines*.¹⁰⁷

In order to support their constituent LGs to fulfil their legislative requirements effectively, in 2016 the PNP interpreted the guidelines and developed a template CHRMAP project for the Shire of Harvey.¹⁰⁸ This provided for a tested case study and framework that would allow other PNP local councils, and indeed other LGs more broadly, to use it in the development of their own CHRMAPs.

To date, 23 high-level CHRMAPs have been completed or are currently underway in WA.

PERSISTENCE AND COLLABORATION

As with any relationship, partnerships are not without their challenges. The formation and ongoing functioning of the PNP was no different. Considerable effort has been required to build the communication and trust necessary for ongoing collective action.

Together they:

- undertake joint research projects
- implement coastal adaptation
- enable a collaborative approach between members, stakeholders and communities
- advocate for climate change adaptation at all levels of government.

Despite the challenges, the PNP have displayed dedication to their vision and have been able to maintain their momentum for more than eight years.

The initial actions of the PNP revolved around creating a shared vision, identifying best practice principles, laying foundations, creating an operating framework and identifying future initiatives and key priorities.

The PNP recognised early that collaboration was the key. The problem was bigger than any one LG and many treatments would merely shift the problem to a neighbour. No single agency or organisation is equipped or able to combat such a complex and multifaceted issue.

The PNP has therefore established working relationships with government agencies, at state and national level, research institutes, consultants and non-government organisations. PNP also serves as a bridging organisation, facilitating interaction and knowledge transfer between science, policy and stakeholders and providing a valuable forum for communication with and between LGs and communities.

The program of activities under the partnerships has thus far yielded:

- case studies
- economic data modelling
- hazard mapping
- identification of key community values.

These products evolved over time and together formed an evidence base, identified priorities and allowed for the creation of tailored coastal adaptation options across the region. Eight years down the track, the PNP has become a respected platform for regional LGs to speak as one voice in informing the national and state government of the key coastal hazard risks facing the region.

The PNP is an exemplar of how a collaborative and regional approach can support preparedness and build resilience in the face of climate change. The achievements have won national awards, demonstrating that persistence, collaboration and cooperation can achieve positive outcomes in the face of enormous challenges.

Coastal erosion hotspots in Western Australia

In August 2019, the state government released the findings of a statewide report on coastal erosion.¹⁰⁹

A total of 55 locations (40 regional and 15 in Perth metropolitan) were identified as 'hotspots' where coastal erosion is expected to impact on public and private physical assets and require management and adaptation action within 25 years.

An additional 31 locations (8 Perth metropolitan and 23 regional) were placed on a watch-list for future monitoring.

Hence, a total of 86 locations within 34 LG areas have been identified as potentially vulnerable to coastal erosion in the longer term.

The dominant causes of erosion hazard risk identified in the report were:

- human-built coastal structures changing natural patterns of sand movement along the coast
- inherently unstable landforms due to underlying geology or geographic location
- landforms becoming unstable due to naturally changing sand supply and extreme or long-term changes in weather and wave conditions

- facilities and assets built close to the coast that cannot withstand erosion
- coastal response to rising sea levels.¹¹⁰

The report identified a range of characteristics that typically contributed to the creation of hotspots, including:

- **proximity:** infrastructure close to the existing shore, or landward of a progressively and rapidly eroding coast
- **instability:** coastal land typically subject to progressive or episodic erosion
- **mitigation costs:** likely to be high
- **transfer:** limited capacity to manage future erosion using existing coastal protection measures. Extension of existing coastal protection is likely to exacerbate erosion transfer
- **community:** coastal areas are highly valued by the community.

The study was a high-level assessment that allowed for comparison between hotspots.

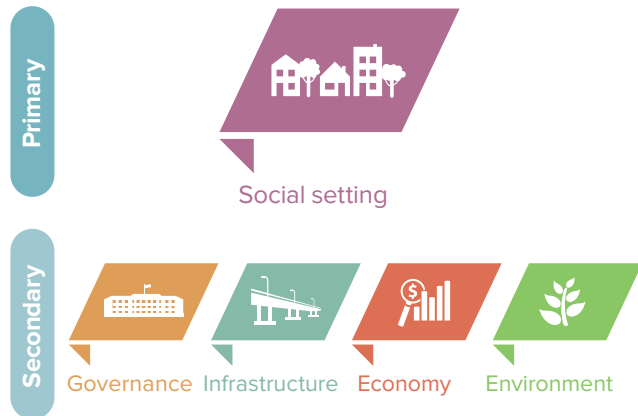
Currently 43 of the 55 coastal erosion hotspots are covered by a high-level CHRMAP. These contain various actions to manage coastal hazards such as erosion.

RELEVANCE

Our valuable coastline is vulnerable to a range of hazards and that any impacts will only be exacerbated by a changing climate. The greatest challenge is to the social setting state core objective, but the effects are expected to be far reaching and further exacerbate the risks posed by almost all hazards. Flow on impacts are expected in the categories of infrastructure, economy, governance, and environment.

The PNP is but one of a number of good examples of how partnerships can yield cooperative and widespread benefits.

The SEMC has long embraced the issue of climate change and has been instrumental in integrating its effects into our understanding of hazards, and importantly in the planning to combat them. An early commitment to action, to develop collaborative, meaningful and sustainable solutions is the path forward, drawing upon the best available research and data.





CHAPTER 11

SUMMARY

11 SUMMARY

The restructuring of the *2019 SEMC Emergency Preparedness Report* was designed to practically highlight that EM is a complex environment.

The more detailed examinations into some of the issues involved were hoped to trigger consideration of how the reader may be impacted. The intent is to pose some scenarios that invoke a response of “I didn’t think of that”, which in turn can stimulate further thought into planning, prevention, preparedness and resilience building measures.

The evidence points to the fact that challenges in the EM space will continue to grow. This is in part due to a changing climate and the associated increase in the frequency and intensity of extreme weather events. But also, the growing and changing demographics and the rising interdependencies that make modern society function (e.g. power, transport, technology, communications reliance, etc.).

Considering this, there is a need to constantly remain on the front foot, looking to the future and over the horizon so we continuously improve and adapt.

To this end, SEMC has a key role to play. Providing the collaborative platforms for organisations and the community to:

- plan and prepare for an efficient whole of state capability
- coordinate and share information efficiently
- understand our vulnerabilities
- driving down the cost of emergencies
- managing down our risks.

The *2019 Emergency Preparedness Report* has adopted a new integrated method of summarising state-wide capability across an array of agency types including HMAs, LGs and ESPs.

The 2019 capability survey received responses from 156 agencies and nearly 90,000 points of data were collected. These have been digested in to capability topic scores which provide a rapid and integrated way of identifying where the state is doing well and where improvements can be made. This will guide the priority of the future work programs.

The inclusion of six deep dive topics in the 2019 report provides a more in depth analysis of emergency events. This can help us to continuously improve our planning, particularly from a cross-portfolio, cross-agency perspective.

Each of the deep dive topics show how the state core objectives can be affected during emergency situations. The state core objectives are fundamental to the SEMC’s work program. They highlight the breadth of what makes the WA society operate and thus what needs to be planned for and protected. SEMC’s view is that this planning and protection is the price of doing business; the price we need to pay to ensure the ongoing stability, well-being and growth of the state.

Community engagement was highlighted as a key component to build resilience to emergency events. It is well established that emergency services cannot face the challenges alone, especially in light of the increasing risks faced. Thus, SEMC aspires towards growing a preparedness culture in WA and the two-way communication channels through community engagement is paramount to this endeavour.

Globally temperatures are on the rise. Each year more temperature records are broken, and this was seen very clearly in Australia during the 2018/19 summer. In the light of climate change, heatwaves will become more frequent and intense. The SEMC must continue its collaborative advocacy of the issue so that organisations and community are aware of the issue and are able to invoke adaptation and mitigation strategies.

The impacts of a biosecurity incursion could be devastating for the WA economy and potentially not fully recoverable.

The SEMC has a key advisory role for all 28 hazards prescribed in EM legislation and needs to ensure that these kinds of hazards (not often visible but have significant consequences) remain on the planning, preparedness and resilience radar. Hazards that we see frequently should not always dominate the agenda; particularly when some of those less frequent have the potential to deliver worse outcomes.

The transportation of hazardous materials shows the complexity involved in striking the optimal balance for the state. It is vital to ensure the economic and productive capacity of the state is maintained while protecting the wellbeing safety and security of the population.

In terms of the SEMC's functions, it is well placed to continue to provide advice and support to agencies, industry, commerce and the community.

The emergency waste management issue highlights the importance for planning not just for response but also in advance of a recovery. When confronted with the unenviable task of cleaning up after a large scale emergency, prior planning comes to the fore. Following the Waroona bushfire, the SEMC promoted a collaborative project on emergency waste management between the State Government and WALGA. The project was designed to improve our readiness for future events. This work needs to continue to be built upon, so that we develop a strong state-wide capacity.

The final deep dive topic looked at the issue of coastal hazards.

With rising global temperatures, sea levels are rising and the frequency and intensity of extreme weather events are increasing. These all have implications for coastal erosion and inundation. The Peron Naturaliste Partnership shows how a locally developed, collaborative approach to risk understanding and resilience building can be developed and sustained. SEMC recognises the inherent knowledge and skills that exist within LGs and the community more broadly. These sorts of resilience building approaches should be encouraged and fostered.

The narrative and findings of the *2019 Emergency Preparedness Report* (and those of the previous reports) can inform ongoing initiatives of the SEMC and other agencies including:

- development of a new and contemporary SEMC strategic plan and associated work plans and task plans for SEMC sub-committees
- ongoing development and application of the exercise and lessons management frameworks
- development of the community resilience framework
- continue to enhance our understanding of the hazards, exposures and vulnerabilities of the state through the State Risk Project
- continue to enhance our understanding of what capabilities we have as a state and where the gaps are through the State Capability Framework
- commencement of investigation on state mitigation policy and mitigation business cases

- help to improve legislative and policy settings to enhance safety and resilience
- collaborate and learn from others (nationally and internationally) especially in terms of catastrophic disaster planning
- engage and participate with the community so resilience can be built bottom-up
- continue to support emergency waste management partnerships to help LGs manage under emergency circumstances
- continue to manage the embedding of the new Disaster Recovery Funding Arrangements
- utilise recovery data to help inform future mitigation and to build back better
- help to build recovery capacity, capability and knowledge across the state
- focus on understanding the implications of interconnectedness and the associated vulnerabilities – power, communications, road networks, etc.
- engagement with non-traditional stakeholders to get them more formally involved with emergency management including the private sector and critical infrastructure owners
- continue to provide, enhance and harmonise grants programs to support mitigation and resilience building programs.

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APPENDICES AND REFERENCES

APPENDICES AND REFERENCES

A – SURVEY RESPONDENTS

Legend: ✓ agency submitted ✗ agency did not submit

Organisation Type	Submission Status	
Hazard Management Agency (HMA) a public authority, or other person, as prescribed by the <i>Emergency Management Act 2005</i> and <i>Emergency Management Regulations 2006</i>	✓ Arc Infrastructure ✓ Department of Agriculture and Food, WA ✓ Department of Finance, Public Utilities Office ^g ✓ Department of Fire and Emergency Services ^h	✓ Department of Health ✓ Department of Transport (Marine Safety) ✓ Public Transport Authority ✓ Western Australia Police
Combat Agency (CA) agencies with clearly identified or legislated roles during an emergency	✓ Department of Communities ✓ Department of Biodiversity, Conservation and Attractions	✓ St John Ambulance Australia, WA
Emergency Support Service (ESS) agencies highly likely to play a role or be called upon during an emergency	✓ Australian Defence Force ✓ Australian Red Cross, WA	✓ Bureau of Meteorology ✓ Department of the Premier and Cabinet
Essential Service Providers (ESP) owners and operators of critical infrastructure that may be impacted or required in recovery	✓ ATCO Gas Australia ✓ Dampier Bunbury Pipeline ✓ Horizon Power ✓ Main Roads WA	✓ National Broadband Network – Australia ✓ Telstra ✓ Water Corporation of WA ✓ Western Power
Industry Body/Other (IB) industry body groups or agencies with non-legislated supporting roles	✓ Department of Education ✓ Department of Planning Lands and Heritage ✓ Department of Water and Environment and Regulation ✓ Forest Products Commission	✗ Insurance Council of Australia ✓ WA Council of Social Services ✓ Western Australian Local Government Association
Local Government (LG) refer to map on following page	✓ 127 LGs submitted	✗ 10 LGs failed to submit

^g Now Energy Policy WA.

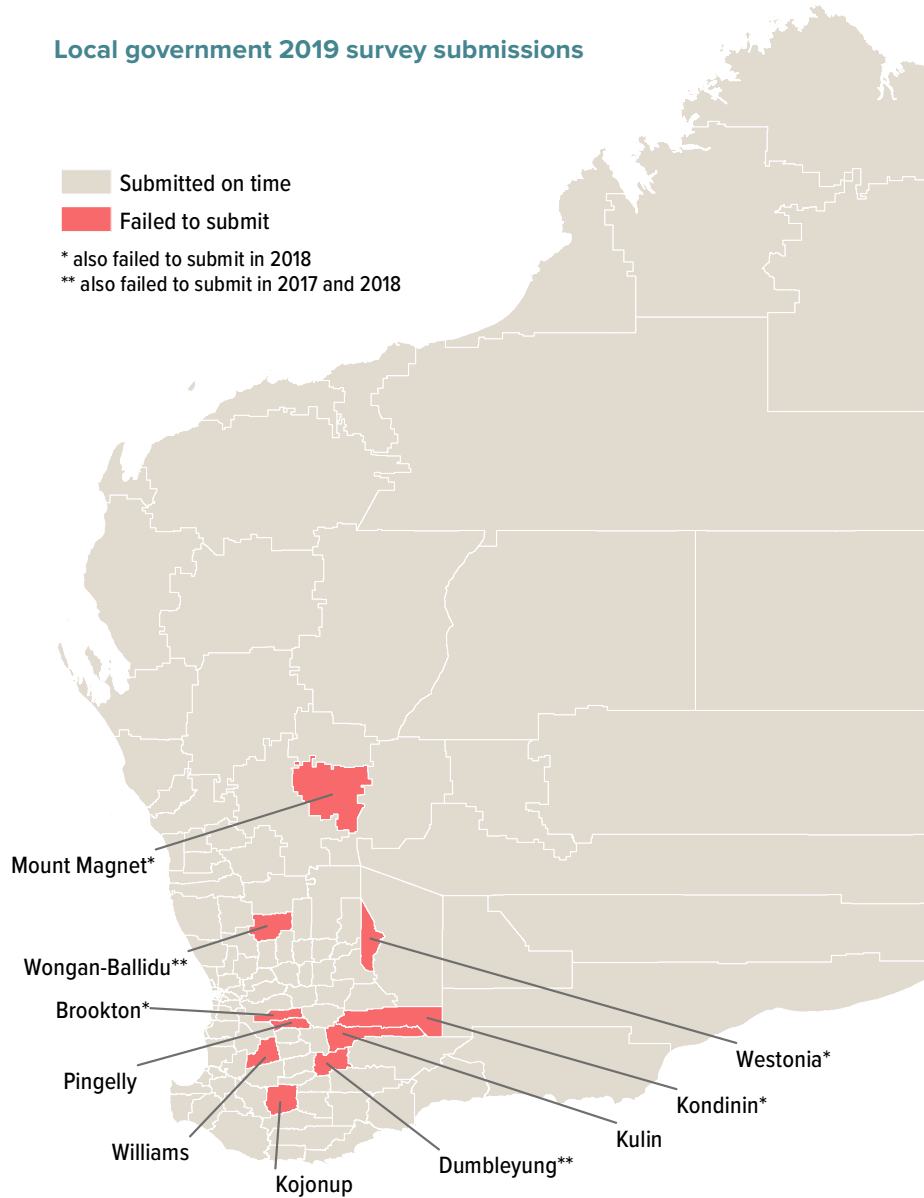
^h In addition to the generic survey, the Department of Fire and Emergency Services (DFES) completed a further eight surveys addressing capabilities against each of their specific hazards. This brings the total number of received surveys to 164.

Local government 2019 survey submissions

- Submitted on time
- Failed to submit

* also failed to submit in 2018

** also failed to submit in 2017 and 2018



B – CAPABILITY TOPICS

Framework Capability Area	Capability topic	Topic description	HMA	CA	ESP	LG	ESS	IB
Analysis and Continuous Improvement	Risk Assessment	Extent of risk assessment skills, and use of findings ⁱ .	●	●	●	●	●	●
	Horizon Scanning	Keeping informed of best practice through review of recent hazard information and monitoring events that occur intrastate, interstate and internationally.	●	●	●	●	●	
	Hazard Information	Keeping informed of best practice through review of recent hazard information.						●
	Lessons Management	Evaluation of performance following an incident, emergency or exercise. Assess and/or amend plans, policies and procedures based on recent hazard information, incidents, response, recovery and exercises. Review and monitor effectiveness of amendments.	●	●	●	●	●	●
Community Involvement	Alerts and Warnings Quality	Procedures ensure alerts and warnings are coordinated with other agencies, timely, reliable and actionable.	●					
	Alerts and Warnings Tools	Emergency/hazard information is provided to the public during <i>response</i> using radio, television, SMS/text messaging, bulk email, websites, Facebook, Twitter, emergency alerts and the Emergency WA website.	●					
	Public Information Quality	Availability of communications personnel. Procedures ensure emergency/hazard information is coordinated with other agencies, timely, reliable, actionable, clear, consistent and accessible. Information caters for culturally and linguistically diverse groups, people with a disability/special needs, those with lower skills in literacy and numeracy, the elderly and tourists.	●	●	●	●	●	●
	Public Information Tools	Emergency/hazard information is provided to the public during <i>prevention</i> , <i>preparedness</i> and <i>recovery</i> using radio, television, newspapers, SMS/text messaging, bulk email, websites, Facebook, Twitter, Instagram, YouTube, newsletters, pamphlets/ brochures, public talks/meetings.	●	●	●	●	●	●
	Sector Information Sharing	Extent of information sharing about individual risks, vulnerable elements ^j and treatment options with state government agencies, LG, business/industry and communities.	●	●	●	●	●	●

ⁱ ESS are not asked about use of risk assessments

^j Examples include, but are not limited to, social groups (such as the elderly, and culturally and linguistic diverse groups), endangered species, areas of scientific significance, essential services and critical assets.

Framework Capability Area	Capability topic	Topic description	HMA	CA	ESP	LG	ESS	IB
Planning and Mitigation	Natural Buffers	Natural buffers ^k that aid community protection are identified, protected, maintained/enhanced and monitored.				●		
	Infrastructure Protection	Identification of likely impacts hazards might have on critical infrastructure and important community assets. Plans are in place to protect critical infrastructure, important community assets, residential properties, assets supporting livelihood and cultural places ^l .		●		●		
	Critical Infrastructure	Identification of likely impact that hazards might have on critical infrastructure. Plans are in place to protect critical infrastructure.			●			●
	Essential Services Protection	Plans to protect the continuity of these essential services, for their organisation: power, telecommunications, water, sewerage, road networks, fuel, food distribution and shelter/accommodation.	●					
	Essential Services Protection	Plans to protect the continuity of these essential services, for their organisation: power, telecommunications, water, sewerage, fuel, food distribution, shelter/accommodation and LG services. Plans to protect road networks and LG services for the community.				●		
	Remoteness Planning	Planning for emergencies that occur in remote areas ^m .	●	●				
	Business Continuity Plans	Effectiveness of business continuity plan, and does it consider EM hazard specific risks and fatigue management.	●	●	●	●	●	●
Resources	EM Personnel	The extent that prevention/mitigation, response and recovery personnel within the organisation are trained, capable, supported and sufficient in number.	●	●	●	●		
	Finance and Administration	Funding for proactive measures/mitigation, response and recovery is available, sufficient and accessible. Ability to track expenditure for particular emergencies (e.g. individual cost codes).	●	●	●	●		
	Equipment and Infrastructure	Ability to manage multiple concurrent emergencies with existing equipment and infrastructure. Plans in place to address equipment mobilisation, pre-deployment, peak surges and outages.	●	●	●	●		

^k The natural environment can provide natural buffers that mitigate the impacts of hazards and protect the community. Examples include mangroves or wetlands that may mitigate flooding or storm surge, vegetation to protect against slope instability or dune systems that may mitigate coastal erosion.

^l E.g. heritage sites, memorials, churches, sporting facilities, etc.

^m Remote areas are those places that are difficult to access. They can include remote Aboriginal communities, pastoral stations, offshore communities, etc.

Framework Capability Area	Capability topic	Topic description	HMA	CA	ESP	LG	ESS	IB
Emergency Response	Situational Assessment	Extent to which situational assessments are effective, and if they determine the nature and extent of the hazard, the vulnerable elements and the resources required.	●	●	●	●	●	●
	Evacuations	Ability, plans and sufficient resources to support directed and recommended evacuations. Pre-emergency evacuation planning is included in their LEMA.				●		
	Evacuation/Welfare Centres	Evacuation/welfare centres have redundancies for food, water, shelter and power.				●		
	Agency Interoperability (including MOU)	Availability of intrastate, interstate, national and international agreements for assistance during large-scale emergencies. Protocols /structures define the interrelationships between stakeholders. <u>Coordination structures</u> are effective, interoperable, functional, manageable/serviceable, and consider recovery implications. <u>Communication systems</u> are effective and interoperable with other agencies.	●	●	●	●		
	Emergency MOU	Availability of intrastate, interstate, national and international agreements for assistance during large-scale emergencies.					●	
Impact Management and Recovery Coordination	Community Welfare	Community services are available, timely and sufficient. Plans are in place to manage directly impacted persons, family and friends of impacted persons, and short term and ongoing mental health/wellbeing support. Extent of strategies for re-establishment of community activities.				●		
	Impact Assessment ⁿ	Ability to contribute to comprehensive impact assessment. Findings are used to inform recovery coordination, EM planning and prevention/mitigation priorities.	●	●	●	●		
	Recovery Resources	Availability of <u>resources</u> to support the reconstruction/restoration of built, social, economic and natural environments.				●		
	Recovery Skills	Availability of <u>skills</u> to support the reconstruction/restoration of built, social, economic and natural environments.				●		
	Sustained Recovery	Sufficiency of resources to sustain a recovery response for 3, 6, 12 and 18+ months.				●		
	Recovery Plans	Recovery plans include input from HMAs, combat agencies/supporting organisations, ESPs, other LGs, NGOs, business/industry and communities.				●		

ⁿ HMAs were also asked about their ability to coordinate comprehensive impact assessments.

C – STATUS OF STATE HAZARD PLANS

SHP – Crash Emergency			
Hazard	Air crash	Rail crash	Road crash
HMA	Commissioner of Police	Public Transport Authority and Arc Infrastructure	Commissioner of Police
Plan Review Date	Aug 2023		

SHP – Animal and Plant Biosecurity	
Hazard	Animal or plant: pests or diseases
HMA	Agriculture Director General
Plan Review Date	Aug 2021

SHP – Collapse/Earthquake – Name of plan still to be determined		
Hazard	Collapse	Earthquake
HMA	Fire and Emergency Services Commissioner	
Plan Review Date	Mar 2021	Aug 2021

SHP – Severe Weather – Final name to be determined			
Hazard	Cyclone	Flood	Storm
HMA	Fire and Emergency Services Commissioner		
Plan Review Date	Mar 2021		

SHP – Energy Supply Disruption			
Hazard	Electricity supply disruption	Gas supply disruption	Liquid fuel supply disruption
HMA	Coordinator of Energy		
Plan Review Date	Dec 2023		

SHP – Fire (Interim)	
Hazard	Fire
HMA	Fire and Emergency Services Commissioner
Plan Review Date	Nov 2024

SHP – Human Biosecurity		
Hazard	HAZMAT Biological substance	Human epidemic
HMA	Chief Executive Officer of the Department of Health	
Plan Review Date	May 2024	

SHP – Maritime Environmental Emergencies		
Hazard	Marine oil pollution	Marine transport emergency
HMA	Chief Executive Officer of the Department of Transport	
Plan Review Date	Aug 2021	

	SHP – Hazardous Materials Emergencies (HAZMAT)	SHP HAZMAT Annex A: Radiation Escape from a Nuclear Powered Warship (NPW)	SHP HAZMAT Annex B: Space Re-Entry Debris (SPRED)
Hazard	HAZMAT Chemical HAZMAT Radiological HAZMAT Other	Radiation escape from a nuclear powered warship	Space re-entry debris
HMA	Fire and Emergency Services Commissioner	Commissioner of Police	Commissioner of Police
Plan Review Date	Aug 2023	Mar 2021	Aug 2020

SHP – Heatwave	
Hazard	Heatwave
HMA	Chief Executive Officer of the Department of Health
Plan Review Date	May 2023

SHP – Search and Rescue Emergency	
Hazard	Land search Marine search
HMA	Commissioner of Police
Plan Review Date	Aug 2023

SHP – Terrorist Act	
Hazard	Terrorist act
HMA	Commissioner of Police
Plan Review Date	Aug 2021

SHP – Tsunami	
Hazard	Tsunami
HMA	Fire and Emergency Services Commissioner
Plan Review Date	March 2021

Note: Hostile act was introduced as a prescribed hazard in March 2020. A SHP has yet to be finalised.

D – RECOMMENDATION TRACKING

Since February 2011 a number of significant inquiries and incident reviews have been carried out following major bushfires in WA. In total 258 recommendations have been delivered within these reports.

Considerable work has been done to implement the recommendations, with only a small number still in progress.

The SEMC Lessons Management Reference Group (LMRG) provides oversight of the state's lessons management framework, including the identification of lessons and monitoring the implementation of resultant actions across the EM sector.

The objectives of the LMRG are to:

1. To hold the EM sector accountable for the lessons learned from incidents, exercises, operational reviews, audits and inquiries.
2. To improve the state's EM capabilities through evaluation of lessons and continuous improvement.
3. To integrate lessons management activities into the EM sector as a normal course of business.

The LMRG is committed to working with the sector to embed the lessons management framework, based on the OILL principle – observations, insights, lessons identified and lessons learnt.

Observations are neutral and come from a range of sources. Observations can be beneficial (things to do more of or do differently) or remedial (things to do differently or to do less of).

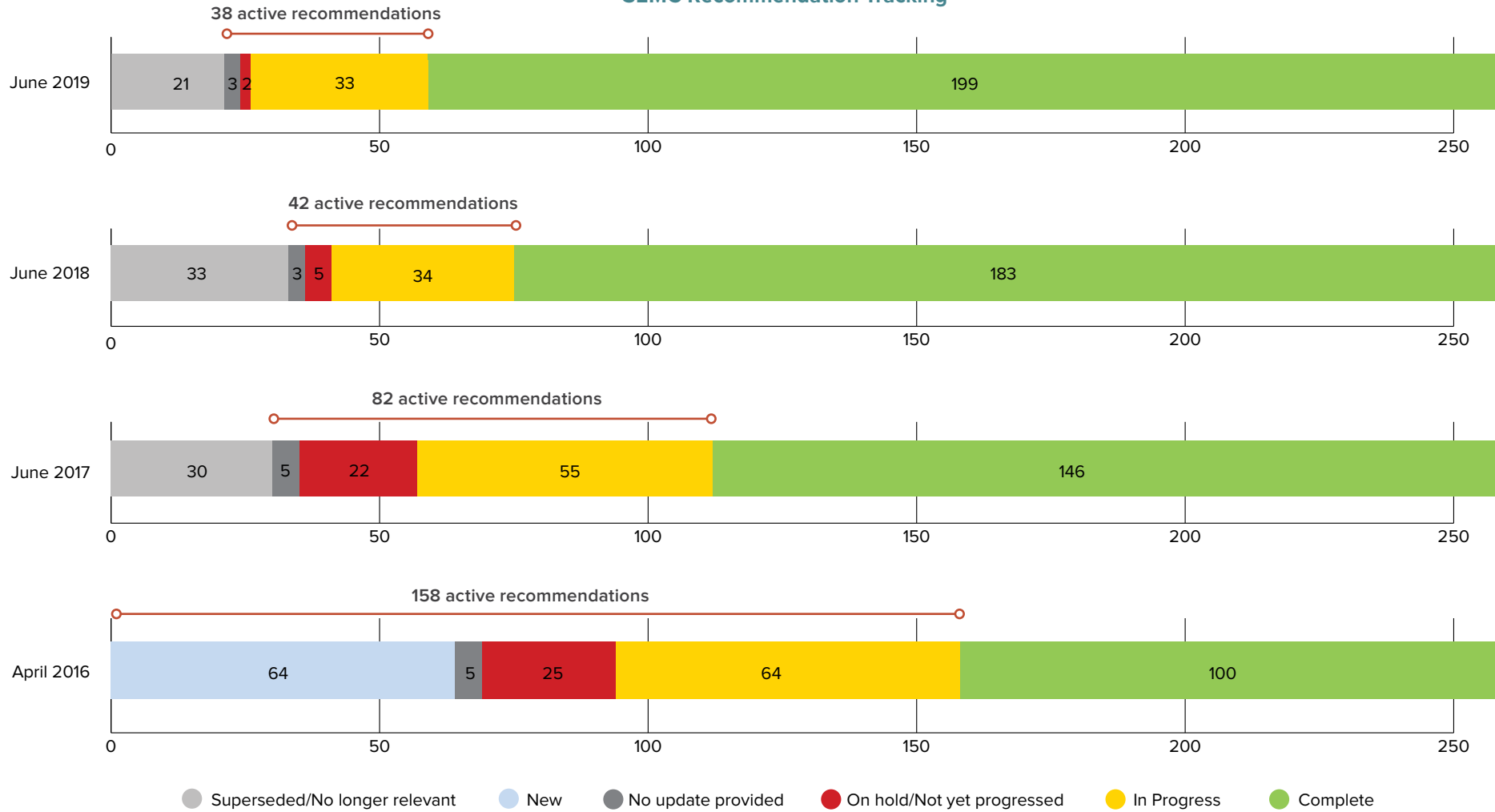
Insights look closely at the observations and investigate issues. For example, liaison with district emergency management committees gathers further observations, considers the impact on different regions and seeks consensus for whether change is needed.

Lesson identified evaluates the insight through the lens of the capability framework. This highlights whether or not the sector meets the desired capability target. A lesson identified contains enough context to clarify the intent of the lesson and the authority to undertake actions to implement. It is important that specific measures are set to evaluate implementation.

Lesson learnt occurs when there is demonstrated behaviour change. To verify that the agreed measures have been met and that the lesson has actually been learnt, a robust checking process is required. There is a wide range of activities that can perform this checking function (such as audits or post-incident reviews). It is our view that exercising plays an important evidentiary role; and the newly implemented state EM exercise policy embraces and integrates lessons management.

A summary of the current status of these recommendations and opportunities for improvement is available on the SEMC website (<https://semc.wa.gov.au/capability-and-preparedness/reports-and-reviews>).

SEMC Recommendation Tracking



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