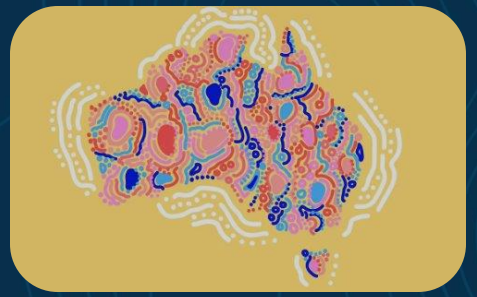
Nat CORR National Centre for OUTDOOR RISK & READINESS



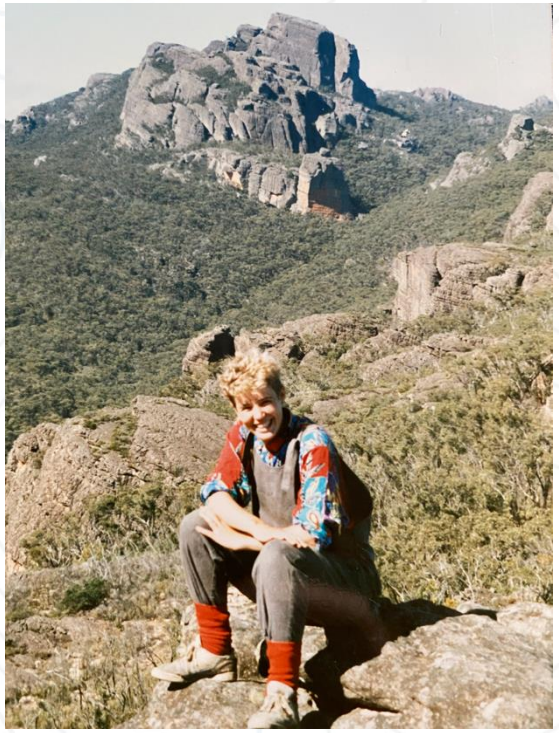
Source: ABC iView

Building Resilience for Climate Change

WRMC 1st October 2025

Dr Loren Miller
Founder NatCORR
Co-Chair and CEO Outward Bound Australia

Dr Loren Miller: a bit outdoorsy and a bit corporate



Outward Bound Australia Instructor in the 1980s

Corporate Career

- Strategy & Finance
- Management Consulting
- University Executive

CEO & Co-Chair Outward Bound Australia

- Founder NatCORR

Agenda

Climate change and natural disaster temperature check

1. Understanding Climate Change & Natural Disaster Risk
   - Introducing a framework for assessing climate change risk
   - Look at lots of case study examples from Australia …

2. Building Climate Change & Disaster Resilience
   - Exploring 8 strategies for building resilience
   - Examples of initiatives
   - Checklists to prompt thinking & action

What can we take away from this?

Temp Check the Room

HEATWAVES
FLOODS EROSION
WILDFIRE STORMS
LANDSLIDES HAIL
DISEASE ANIMAL
HURRICANES MGRATION
CYCLONES
COASTAL STORM SURGES

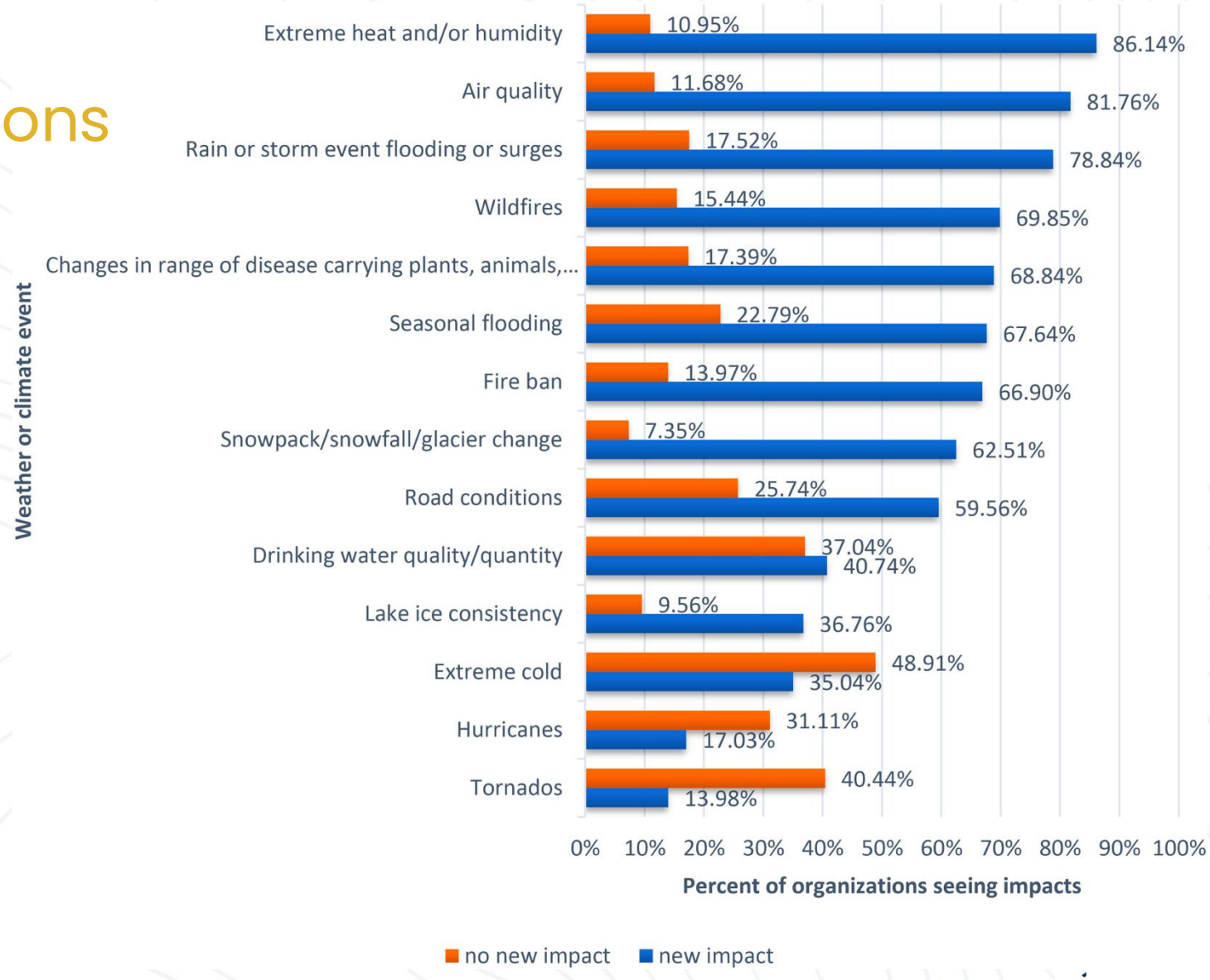
Are natural hazards increasing your risk in the outdoors?

Which ones?

Is this changing?

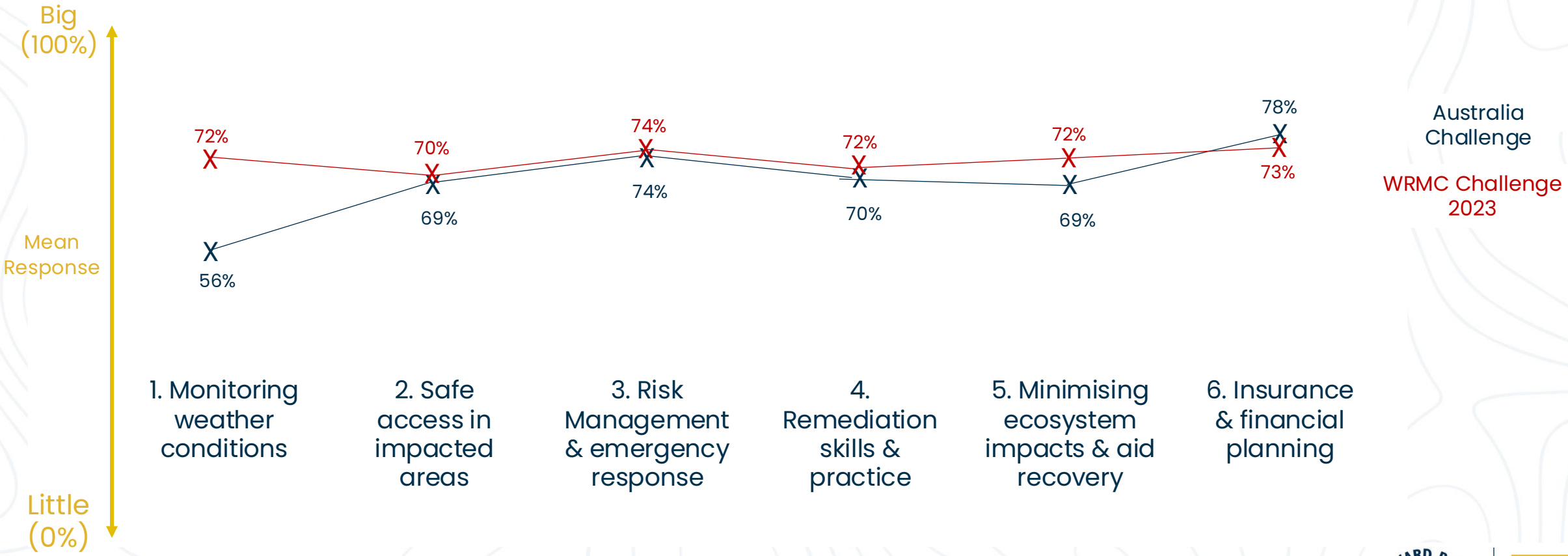
2023 Survey of 127 outdoor organisations

Jackson et al.



Jeff S. Jackson, PhD , Stuart L. Slay, MA, and Shana L. Tarter, 2025. Climate Change Impact on Outdoor Organisations Today. Wilderness & Environmental Medicine, 2025, Vol. 36(1) 7-18

NatCORR survey results



9 Highest ranked challenges

Extent of Challenge /100

Risk Management

79% Lack of time and expertise to practice scenarios.

77% Few mechanisms for cross-sector (outdoors, land management, research, govt) collaboration:
- complex to navigate

76% Limited support when an incident occurs:
- isolated
- resource depleted.

Finance & Insurance

79% Access to adequate, affordable insurance to protect business continuity and assets.

79% Access to government relief or grants:
- Red tape and time demands
- Inequity by jurisdiction
- Subject to political influence

76% Few organisations have sufficient reserves or access to additional emergency cashflows to see through periods of disasters.

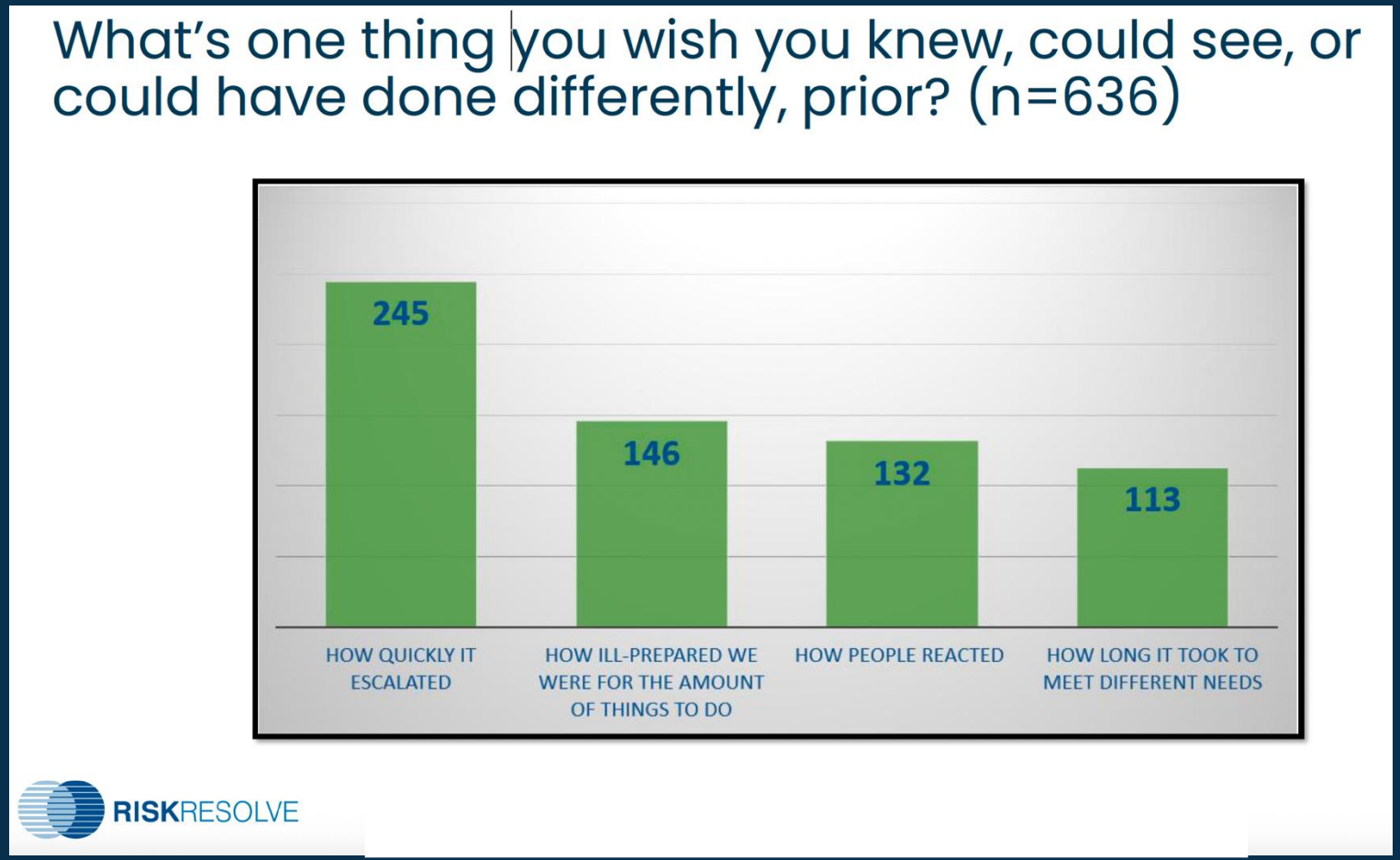
Remediating Impact

79% Workforce shortages at middle management level post COVID have impacted knowledge and expertise.

76% Increasing need for skills in hazardous driving, vehicle retrieval, tree evaluation and lopping, chain-sawing and water retrieval.

When things do go wrong in the outdoors, we wish we had been better prepared

Dr Clare Dallat,
Risk Resolve
Global Survey



1. Climate Change Risk Assessment

Changes in climate relevant to hazards and natural disasters

Increased frequency of large-scale heatwaves and record-high temperatures

Longer fire season with more extreme fire danger days

Prolonged high ocean temperatures

Reduced average rainfall and more time spent in drought

An increase in heavy rainfall

Increased frequency of coastal storm surge inundation

occurring now ⬇ ⬇ ⬇ ⬇ emerging threat

Source: State of the Climate Bureau of Meteorology/CSIRO

Australia is already seeing climate-change-influenced events leading to natural disasters

Millennium Drought
1996-2009

Black Saturday
Feb 2009

Victorian and
Queensland Floods
2010-2011

Record Hot
Summer
January 2013

Tasmanian
Fires October
2015

Tasmanian
Floods June
2016

NSW June 2016

SA System Black
Sept 2016

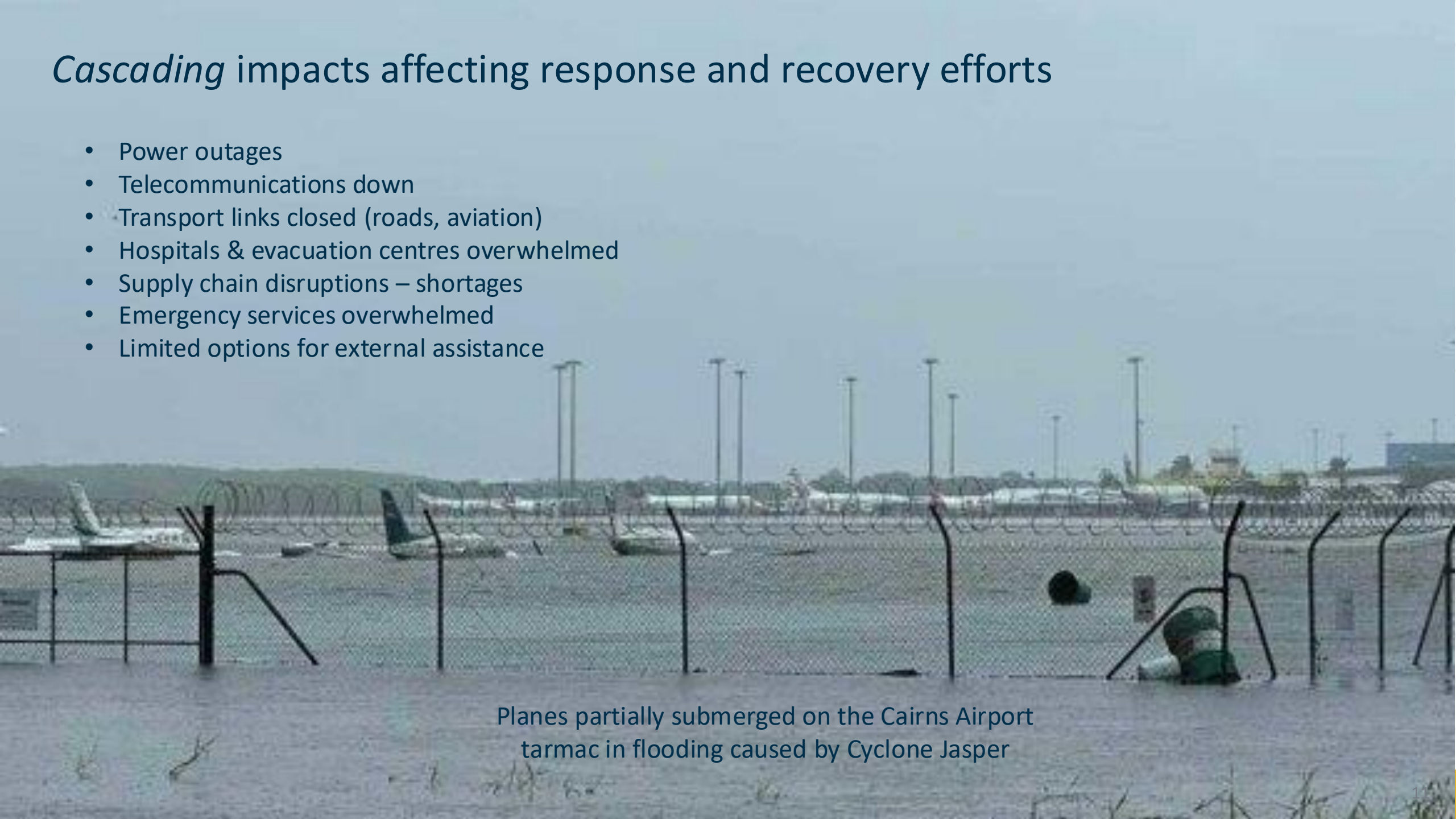
Eastern
Australian
Drought
2017-2019

Victorian and NSW
Black Summer 2019

Qld, NSW,
Vic floods
2022

Cascading impacts affecting response and recovery efforts

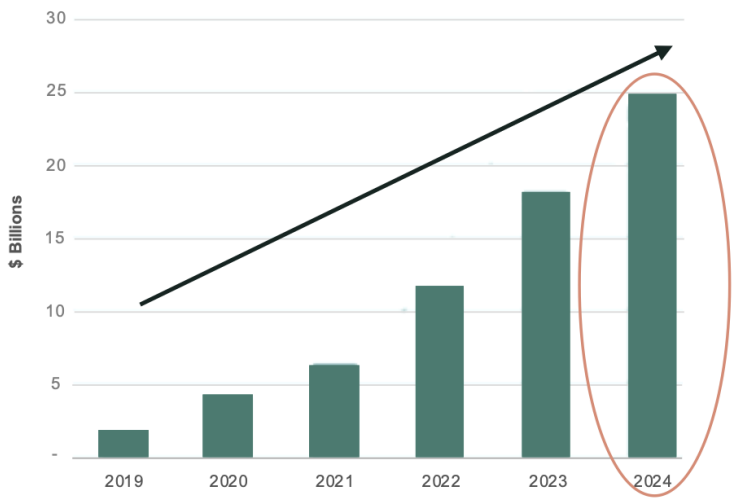
- Power outages
- Telecommunications down
- Transport links closed (roads, aviation)
- Hospitals & evacuation centres overwhelmed
- Supply chain disruptions – shortages
- Emergency services overwhelmed
- Limited options for external assistance



Planes partially submerged on the Cairns Airport tarmac in flooding caused by Cyclone Jasper

Recovery and reconstruction is growing at an accelerated rate: by ~2060, this figure could increase beyond $130 billion

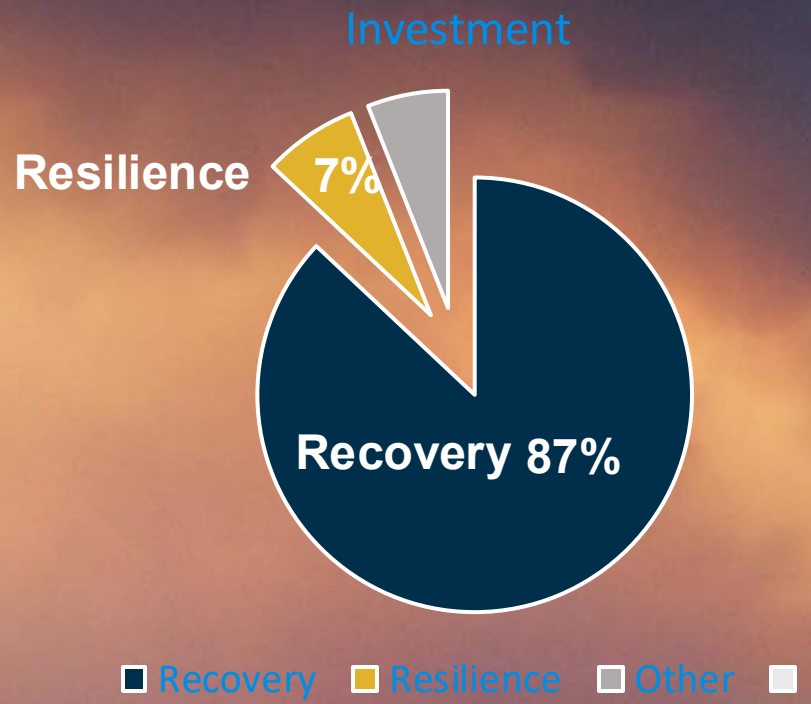
NEMA's Administered Program Expenditure Profile 2019 to 2024



2024 programs equate to approx. $24.3 billion

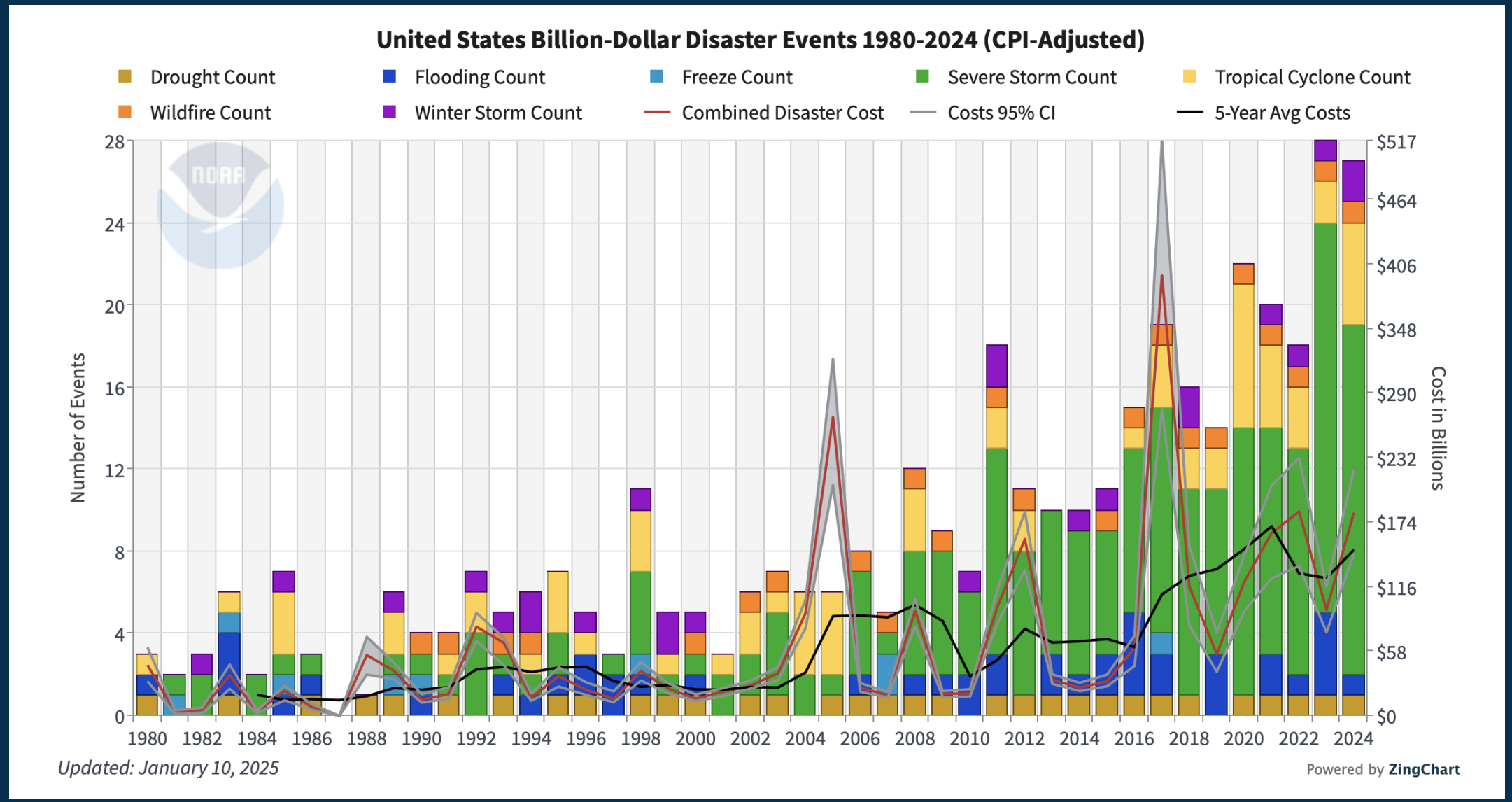
Source: NEMA Presentation, Natural Hazards Research Forum 2025

National Emergency Management Agency



Are we already stuck in a cycle of constant recovery?

Photo: Thick smoke plumes from an out-of-control bushfire in south western Australia. Source: Philip Thurston



NOAA National Centers for Environmental Information (NCEI) U.S. Billion-Dollar Weather and Climate Disasters (2025). https://www.ncei.noaa.gov/access/billions/, DOI: 10.25921/stkw-7w73

United Nations

Sendai Framework for Disaster Risk Reduction 2015 - 2030

Following on from the 2005 Hyogo Framework for Action

Acknowledging Natural Disasters are accelerating in frequency and intensity

Sendai Framework Priority Actions

Priority 1	Priority 2	Priority 3	Priority 4
Understanding disaster risk	Strengthening disaster risk governance to manage disaster risk	Investing in disaster risk reduction for resilience	Enhancing disaster preparedness for effective response, and to «Build Back Better» in recovery, rehabilitation and reconstruction

Source: UN Sendai Framework for Disaster Risk Reduction 2015-2030.

Australian Government

Australian Climate Service

2025

Australia's National Climate Risk Assessment: An Overview

The Australian Climate Service is a partnership of:

Australian Government
Bureau of Meteorology

CSIRO

Australian Bureau of Statistics

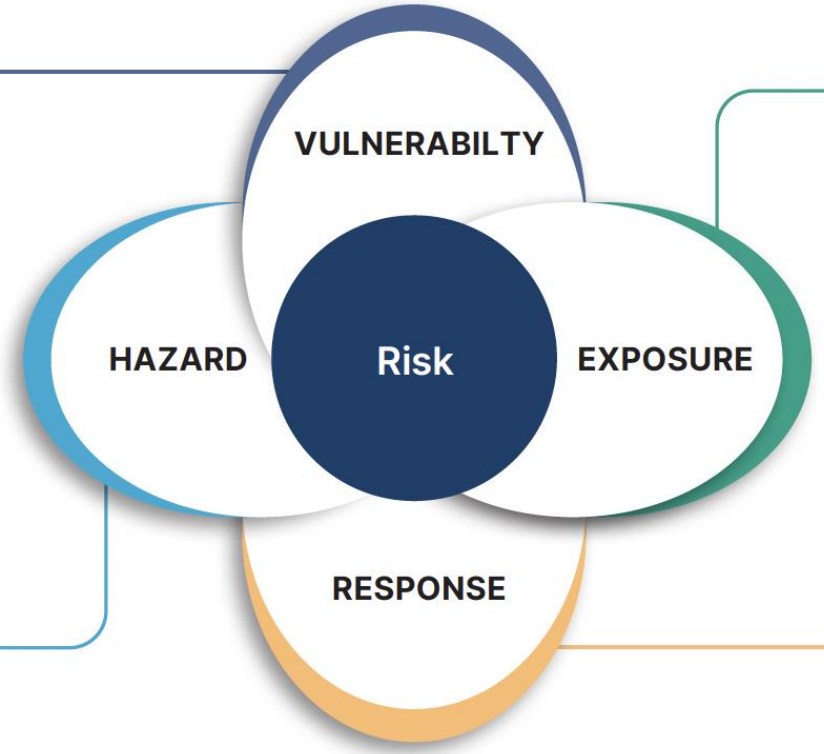
Australian Government
Geoscience Australia

Understanding Disaster Risk

DYNAMIC INTERACTIONS

VULNERABILITY is the propensity or predisposition to be adversely affected. It encompasses a variety of concepts and elements, including sensitivity to harm and capacity to cope and adapt.

EXPOSURE is the presence of things that could be adversely affected by climate and weather-related hazards. These include people, ecosystems, services, resources, infrastructure, or economic, social, and/or cultural assets.



HAZARD is the potential occurrence of an event or trend that may cause health impacts and damage to property, infrastructure, livelihoods, services, ecosystems, and environmental resources.

RESPONSE refers to how actions to address climate risks might not work as planned or could create other problems.

Adapted from the Intergovernmental Panel on Climate Change (IPCC) and Simpson et al., 2021

What does this mean for the outdoors sector?

Outdoors Sector Climate Risk Assessment

Climate & Hazards

- Extreme heat
- Bushfires & Smoke
- Storms & cyclones
- Floods
- Erosion / landslide
- Algal blooms
- Insect born disease

Exposures

- ???

Vulnerabilities

- ???

IMPACTS AND RISKS

- ???

Outdoors Climate & Disaster Risk Template

Climate & Hazards

- ???

Exposures

- ???

Vulnerabilities

- ???

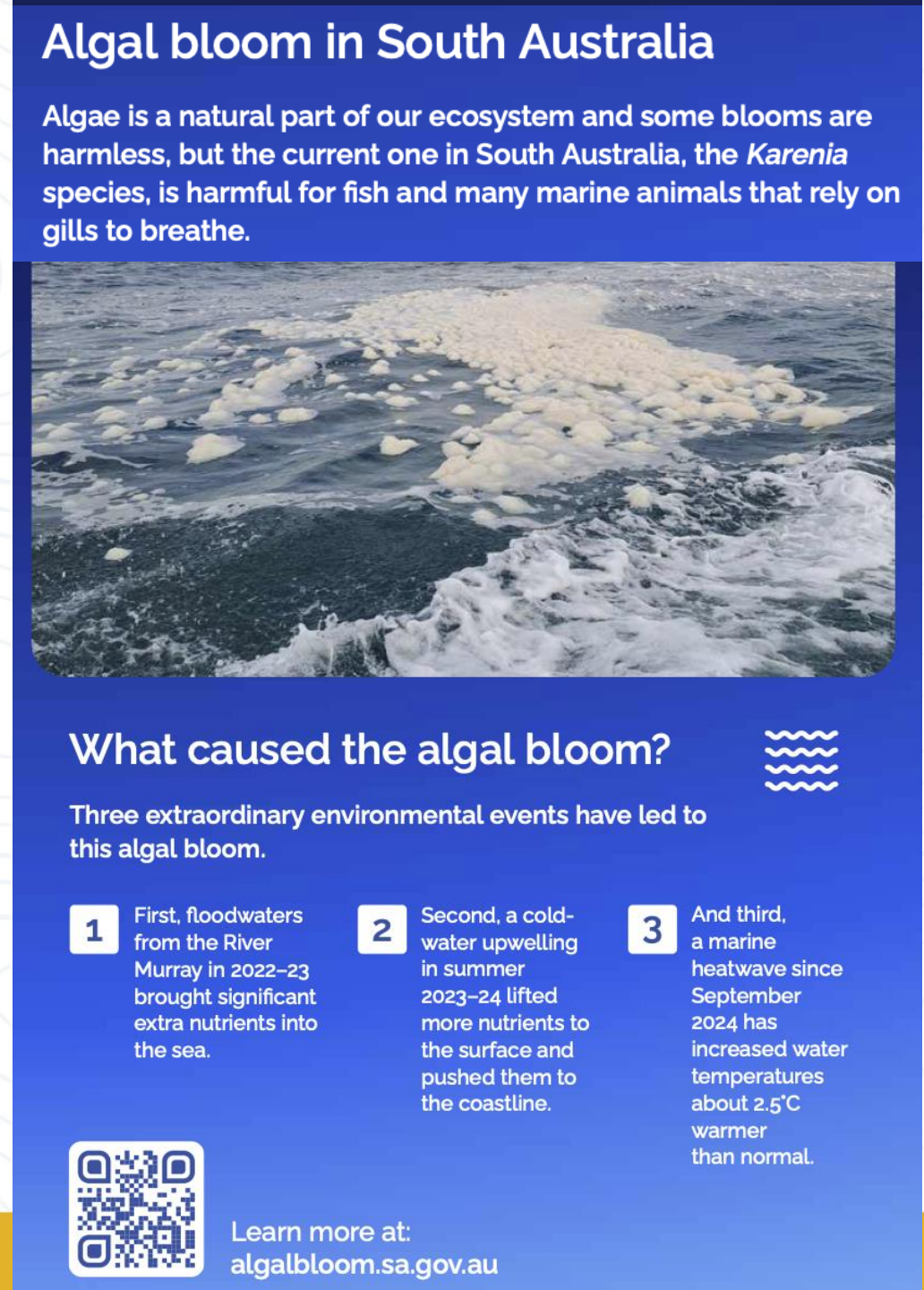
IMPACTS AND RISKS

Lets look at some hazards and case studies

SA Algal Bloom !!!

- Arrived in March 2025 – with *Karenia*, a harmful species
- Killing marine life
- Unsafe to swim, fish or use beaches in areas impacted by toxic version of the bloom

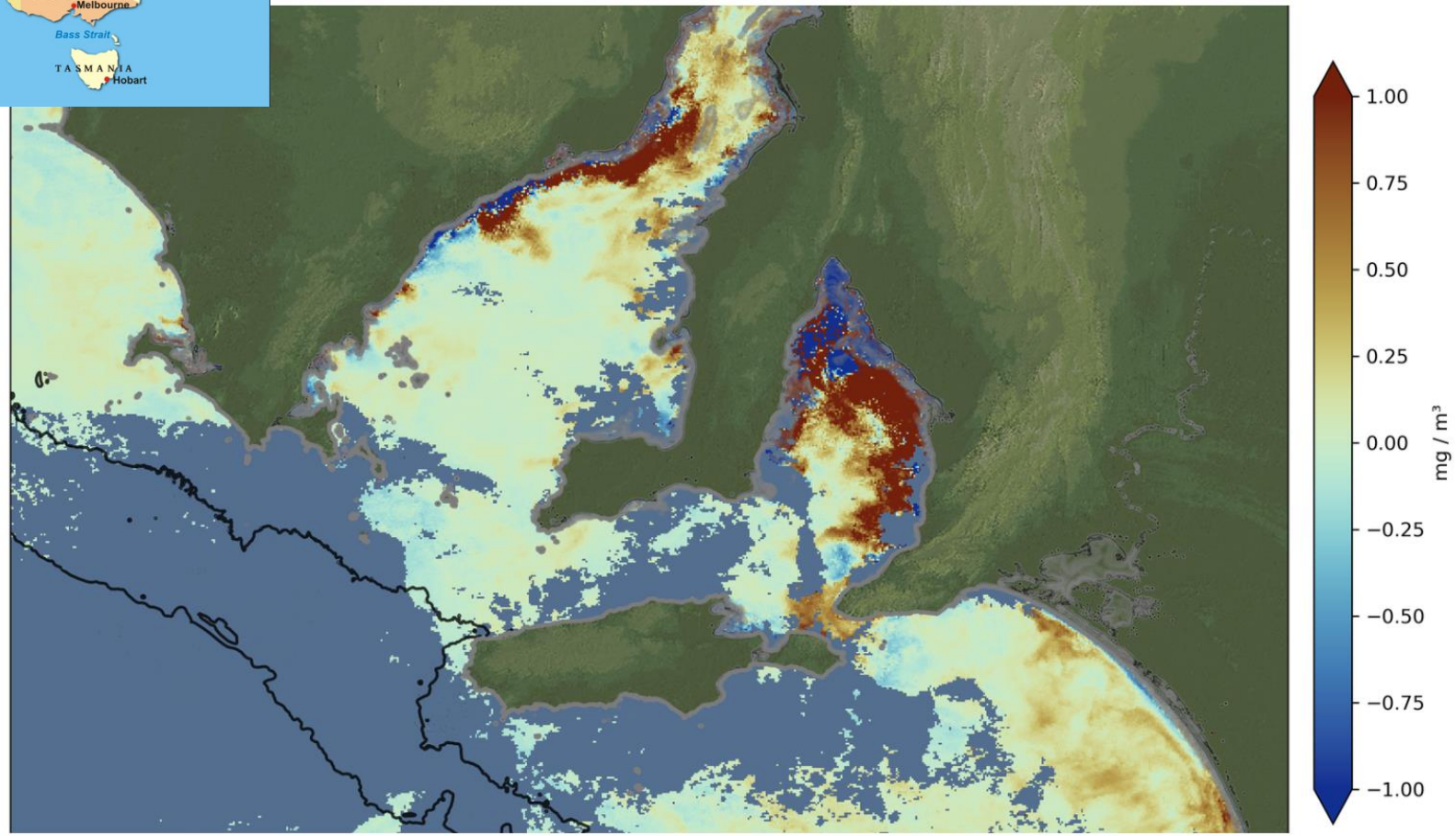
- No known interventional fix – needs decrease in water temp and nutrient levels, and wind & waves to break it up
- Duration unknown – up to 4 months - 2 years?
- Happened other places – SA Coffin Bay 2014 (4 months), NZ (2 years), Florida, Poland, Germany & Netherlands
- Limited grant support <$10k business, $100k for fisheries



https://www.algalbloom.sa.gov.au/support-from-government

The algal bloom is moving and changing and, because it's affected by weather and ocean currents, it's hard to predict exactly where it'll go next.

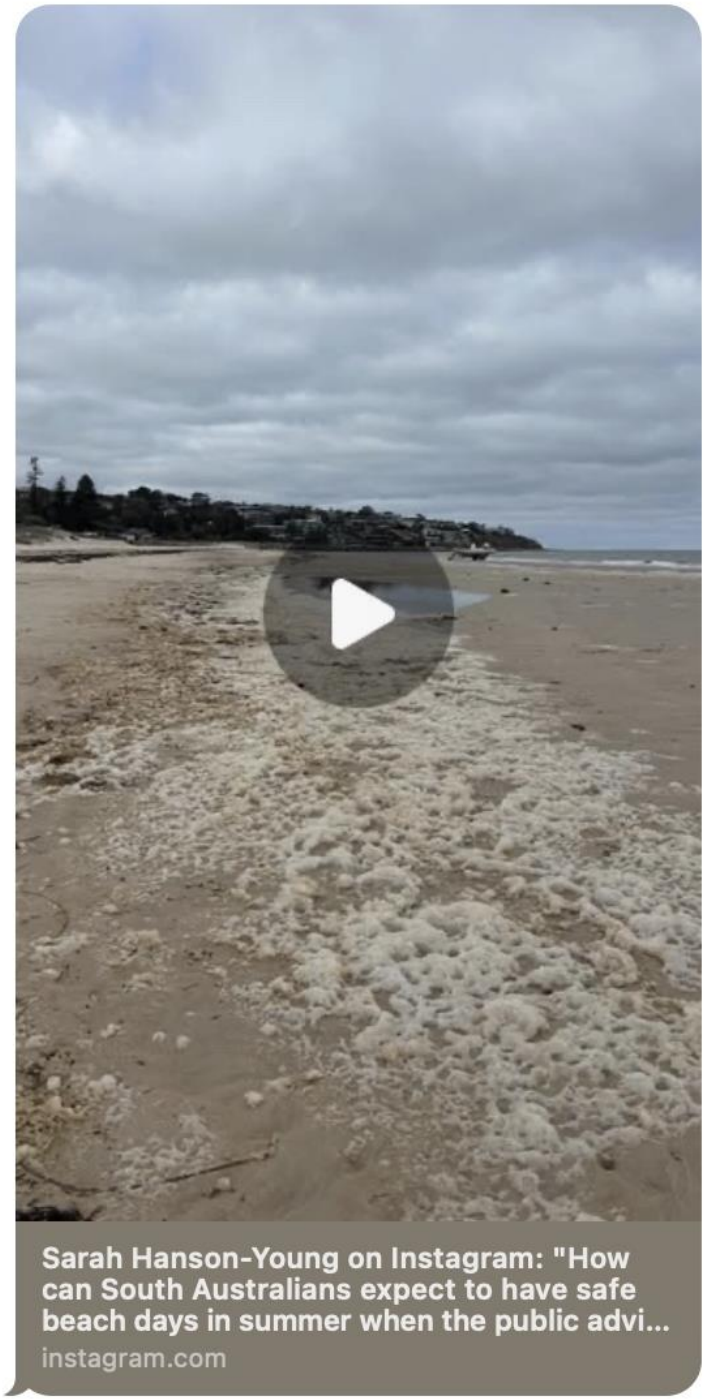
Satellite imagery of chlorophyll-a, which provides an indicator of algae concentrations but not necessarily concentrations of harmful algae, is being used to monitor the algal bloom. Areas in red have higher levels of chlorophyll-a, as shown in the map below.



Time lapse video
Jan – Aug 2025

Map date - 22 September 2025

- Doesn’t meet the official definition of ‘natural hazard’
- Limited grant support
- Late / limited testing
- No link between testing and health advice



https://www.abc.net.au/news/2025-10-01/algal-bloom-has-left-the-sa-coast-in-uncharted-waters/105784050

Sarah Hanson-Young on Testing

Algal Bloom water testing open data dashboard

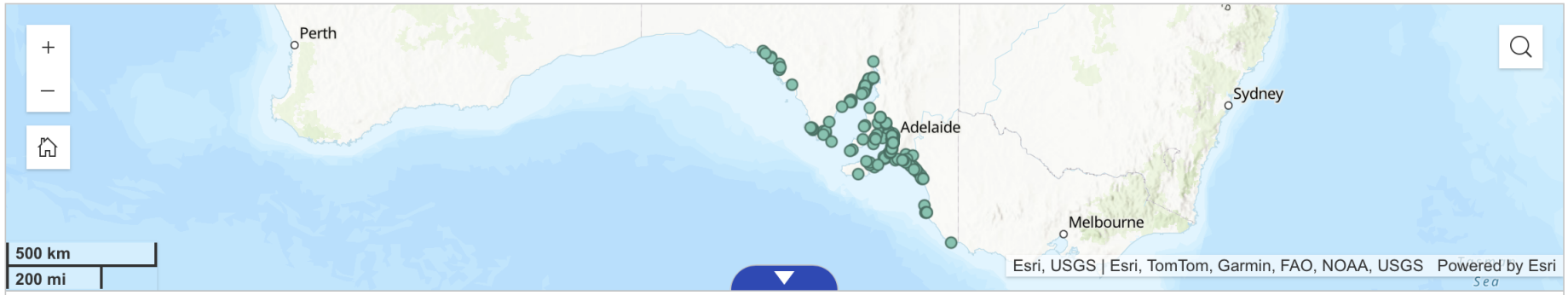
Government of South Australia

About this dashboard

This dashboard provides timely open access to water testing results from coastal and estuarine sites across South Australia. Water samples are analysed using light microscopy to identify and count microalgae (phytoplankton) typically >5um in size, for including potentially harmful algae species (including *Karenia* spp.). The dashboard is part of the South Australian Government's coordinated response to the harmful algal bloom. It reflects a commitment to transparent reporting and public awareness. Data is updated as new results become available and may be subject to further analysis and interpretation by scientific agencies and partners. Additional features will be added over time to improve usability and support response efforts. All cell counts are reported in cells/L to ensure consistency across the state.

How to use the dashboard

Click on map sites to view testing information. Use filters to explore or export data. Select the arrow tab below the map to collapse or expand the full data table.



Sample results

Site description	Date sample colle…	Result name	Result	Species group	Test name
Encounter Bay Boat Ramp	25/9/2025	Geosmin-MIB producing B…	0 cells/L		Algal Count - Part
Encounter Bay Boat Ramp	25/9/2025	Toxin producing BGA - Total	0 cells/L		Algal Count - Part
Encounter Bay Boat Ramp	25/9/2025	Chroomonas	Very Low Abundance (appr…		Algal Identificatior
Encounter Bay Boat Ramp	25/9/2025	Nitzschia	10,000 cells/L		Algal Identificatior
Encounter Bay Boat Ramp	25/9/2025	Phytoflagellates	Low Abundance (approx. 1…		Algal Identificatior

Total: 18,740 | Selection: 0

More information

For updates and more information, visit algalbloom.sa.gov.au.

Disclaimer

The information and data on this dashboard is subject to change without notice. If you rely on this data, you are responsible for independently verifying its accuracy, currency and completeness.

Test results

(use filters to refine results)

Encounter Bay Boat Ramp
Sampling date: 25 Sep 2025
Geosmin-MIB producing BGA - Total: 0 cells/L

Encounter Bay Boat Ramp
Sampling date: 25 Sep 2025
Toxin producing BGA - Total: 0 cells/L

Encounter Bay Boat Ramp
Sampling date: 25 Sep 2025
Chroomonas: Very Low Abundance (approx. 1 to10 cells/mL)

Encounter Bay Boat Ramp
Sampling date: 25 Sep 2025
Nitzschia: 10,000 cells/L

Encounter Bay Boat Ramp
Sampling date: 25 Sep 2025

Total: 18,740 | Selection: 0

SOURCE: https://experience.arcgis.com/experience/5f0d6b22301a47bf91d198cabb030670

Exposures:

- Floods - river runoffs increasing nutrient levels
- Ocean cold water upswelling
- Sea warming warming
- Coastal regions with captured currents eg bays, peninsulas
- Being near or on beaches
- Close contact with the waterways (boating, swimming, fishing)

Vulnerabilities:

- Coastal regions – bays, often populated
- Beach activities – hiking, camping, swimming, playing
- Water activities – surfing, boating, fishing
- Access to reliable information about the risks

Impacts:

- Extreme loss of marine ecosystems
- Confusion, anger and frustration
- People don't or can't go to the beach or boating – or can they?
- Program cancellation, business losses
- Health implications

Exposures:

- Warmer, hotter summers, more heat days in succession
- Off-season hot days
- Locations with high heat & humidity patterns
- Areas and activities with limited shelter or access to water
- High exertion activities – hiking uphill with packs, rock climbing

Vulnerabilities:

- Unacclimatised participants
- People with other health issues
- Lack of awareness & disclosure of symptoms
- Culture of ‘tough it out’

Impacts:

- Potential injury or loss of life
- Limited programs in summer
- Less use of high heat exposure areas
- Fewer or shorter high exertion activities
- Changes in timing of activities
- Market confidence in the outdoors
- Financial & business losses


“Heat stress is the leading cause of weather-related deaths worldwide”
World Health Organization
489,000
Deaths Per Year

Globally

2.41 billion workers

70 per cent of the working population

are exposed to excessive heat

This results in

22.85 million non-fatal injuries

and

18,970 deaths annually

NatCORR Symposium July 2025: Keynote Dr Grant Lynch, University of Sydney

Regions with the **highest** workforce exposure to excessive heat:

- **Africa** 92.9% of the workforce %
- **The Arab States** 83.6% of the workforce %
- **Asia and the Pacific** 74.7% of the workforce %

Region with the **most rapidly increasing** workforce exposure to excessive heat since 2000:

- **Europe and Central Asia** 17.3% increase

Regions with the **highest proportion** of occupational injuries attributable to excessive heat:

- **Africa** 7.2% of all occupational injuries %
- **The Americas** 6.7% of all occupational injuries %

Regions with the **most rapidly increasing** heat-related occupational injuries since 2000:

- **The Americas** 33.3% increase
- **Europe and Central Asia** 16.4% increase

26.2 million

people living with **chronic kidney disease** attributable to heat stress worldwide.

International Labour

Recognising heat-illness is hard

- Non-Specific Symptoms
- Symptoms Develop Gradually
- Visible Symptoms Can Be Misleading
- No Single Warning Sign
- Overlap With Other Medical Issues
- People Often Don’t Report Existing Illness

THE UNIVERSITY OF SYDNEY

Individual-level strategies	Workplaces	Schools	Playing sports	Outdoor Programs
Electric fans	●	●		
Self-dousing	●	●	●	●
Foot immersion				
Drinking cold water[3]	●	●	●	●
Optimising clothing	●[4]	●	●[4]	●
Evaporative coolers	●	●		
Ice towels			●	
Wet clothing			●	●
Shaded areas	●	●	●	●

OUTWARD BOUND AUSTRALIA EST 1956

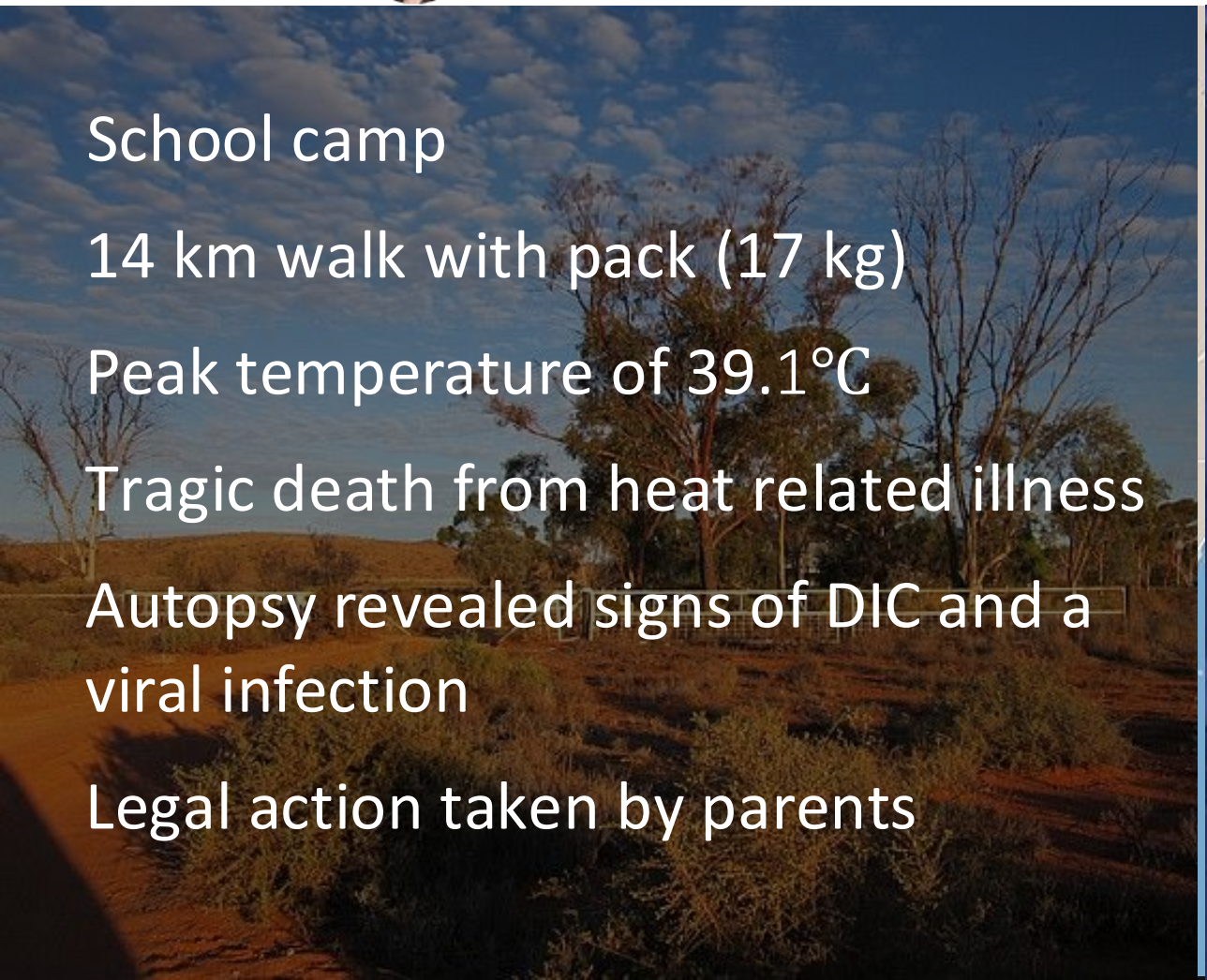
Nat CORR

Adapted from Jay et al. (2021) Lancet

'Devastated': Huntingtower parents sue over son's school camp death

Henrietta Cook
February 21, 2019 — 1.36pm

Save | Share | A A A | 1 View all comments



School camp

14 km walk with pack (17 kg)

Peak temperature of 39.1°C

Tragic death from heat related illness

Autopsy revealed signs of DIC and a viral infection

Legal action taken by parents

Exposures:

- Warmer atmosphere leading to more moisture and heavier rain
- Extreme rainfall events more frequent and intense
- Flash flood risk rising due to short-duration heavy downpours
- ‘Surprises’ with record breaking events
- Fire impacts, eroded landscapes, levee failures exacerbating risks
- Closure of National Park, roads and business

Vulnerabilities:

- Campers & tourists in high risk spots
- Outdoor program cancellations
- Participant risk aversion
- High cost in loss of infrastructure
- Insurance cost escalation & market failure

Impacts:

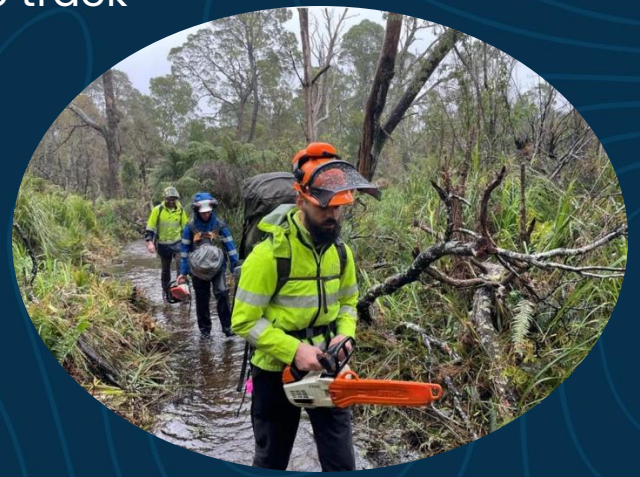
- Potential injury or loss of life
- Environmental damage
- Limited venues / seasons
- Market confidence in the outdoors
- Financial & business losses

Outdoor Sector Impacts

Wilson's Promontory, VIC 2011

- 400+ campers airlifted after flash flooding cut off access
- Roads, trails and bridges destroyed

- Ongoing storm impacts
- Iconic Sealers Cove track closed since 2021



Photos: ABC News and Parks Vic and Bushwalking Vic

Outdoor Sector Impacts

Echo Creek School Camp Evacuation, QLD 2018

- 70+ students trapped for a week by floodwaters near Tully
- Military-led evacuation via airlift
- Walking tracks, lookouts and campsites closed for months to years

Three planes took off from Tully airport about noon destined for Townsville. *(Supplied: AnnastaciaMP)*

Photos: ABC News and QLD police

Buchan - Boxing Day Flash Flood 2023

https://www.youtube.com/watch?v=wXTefLZPYJw

- Normal day, the beginning of our ‘peak’ tourist season.
- Some moderate rain was predicted however no emergency warnings had been issued
- At 4:30pm on 26th of December more than 60 millimetres of rain fell in **30** minutes, causing a flash flood.
- Water came up over 1.5m above ground level, inundating roads within minutes.
- Best described as a Tsunami, due to the topography of the reserve, it filled up with waterlike a fish bowl.
- Vehicles trapped in floodwater as people tried to evacuate
- Buildings and bridges were inundated with water and large volumes of debris and silt spread throughout the reserve.
- Most devastating of all was the loss of two lives

Exposures:

- Wetter climate phases (e.g. La Niña) and extreme rainfall increasing risks
- Coastal storms and king tides
- Post-fire landscape instability
- Expanding geographic impact areas
- Road & bridge closures limiting access
- Business disruption, loss of land access and use

Vulnerabilities:

- ‘One road in’ locations
- Dangerous or closed trails & tracks
- Iconic, steep natural landscapes – Blue Mts, Great Ocean Rd, Wilsons Prom, Daintree
- Government funding & planning controversy and delays for repairs and re-builds to higher standards
- Insurance cost escalation & market failure

Impacts:

- Challenging evacuations
- Potential injury or loss of life
- Environmental damage
- Limited access to venues / areas
- Over-crowding in alternative areas
- Financial & business losses

Outdoor Sector Impacts

Blue Mountains Landslides, NSW

2022

- 2 tourists killed by rock fall from cliff collapse
- Wentworth Pass lookout track

2017

- Contract worker killed by landslide during maintenance works
- National Pass Track at Wentworth Falls

- Ongoing track closures and increased ranger safety reviews

Photos: ABC News. And ABC News

Outdoor Sector Impacts

2022/23 Bogong High Plains Road, Vic

- Series of landslides closed the road access to Falls Creek Alpine Resort for 6 months
- Impacts on school camps, events and summer tourism

Falls Creek landslide wipes out summer trade and raises fears of bleak winter

Benjamin Preiss
January 3, 2023 — 5.00am

A report by consultancy Urban Enterprise predicts the road closure will result in losses of $33.9 million in direct expenditure at Falls Creek, and another $26.3 million in indirect spending.

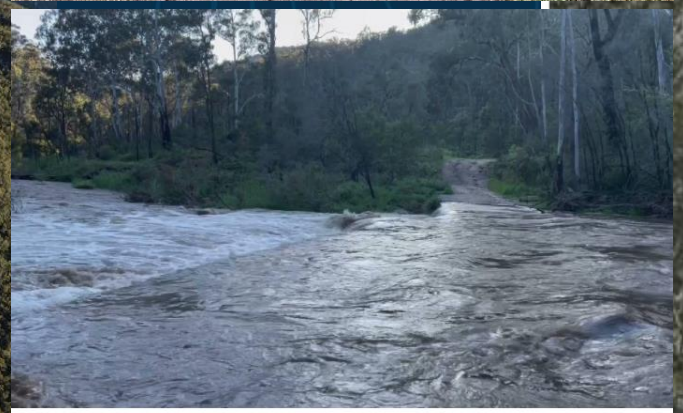
The report modelled the economic, social and community impact from October last year through to April. The economic blow included the cancellation of several planned summer events.

Source: The Age

Wolgan Valley isolated: residents believe road is expected to be shut for a year

BL

By B C Lewis
Updated November 21 2022 - 2:02pm, first published November 18 2022 - 6:00pm



Wolgan's emergency track has been cut off after more flooding. Picture by Wolgan Valley Association.

https://www.bluemountainsgazette.com.au/story/7985334/wolgan-valley-isolated-residents-believe-road-is-expected-to-be-shut-for-a-year/ Photo supplied Wolgan Valley Association.

Exposures:

- Hotter, drier summers and winters
- 56% increase in **Extreme Fire Danger** days since 1979
- Longer fire season (+27 days since 1979)
- More storms causing lightning strike fires
- Fire behaviour exceeding historical norms (e.g. fire-generated thunderstorms

Vulnerabilities:

- Forested, natural growth areas
- Remote areas that challenge evacuations
- Traditional warmer holiday periods – now higher risk for fires
- Risk aversion for children / schools
- Insurance cost escalation & market failure

Impacts:

- Potential injury, loss of life, lost facilities
- Environmental damage
- No access to areas for extended periods
- Over-crowding in alternative areas
- Cancellations, business loss, risk aversion
- Competition for recovery support

2019-20 Black Summer Impact

- Estimated property cost of ~$100 billion
- $1.7 billion in direct economic loss to tourism
- $2.8 billion in tourism supply chain related loss
- 7300 jobs lost

33+

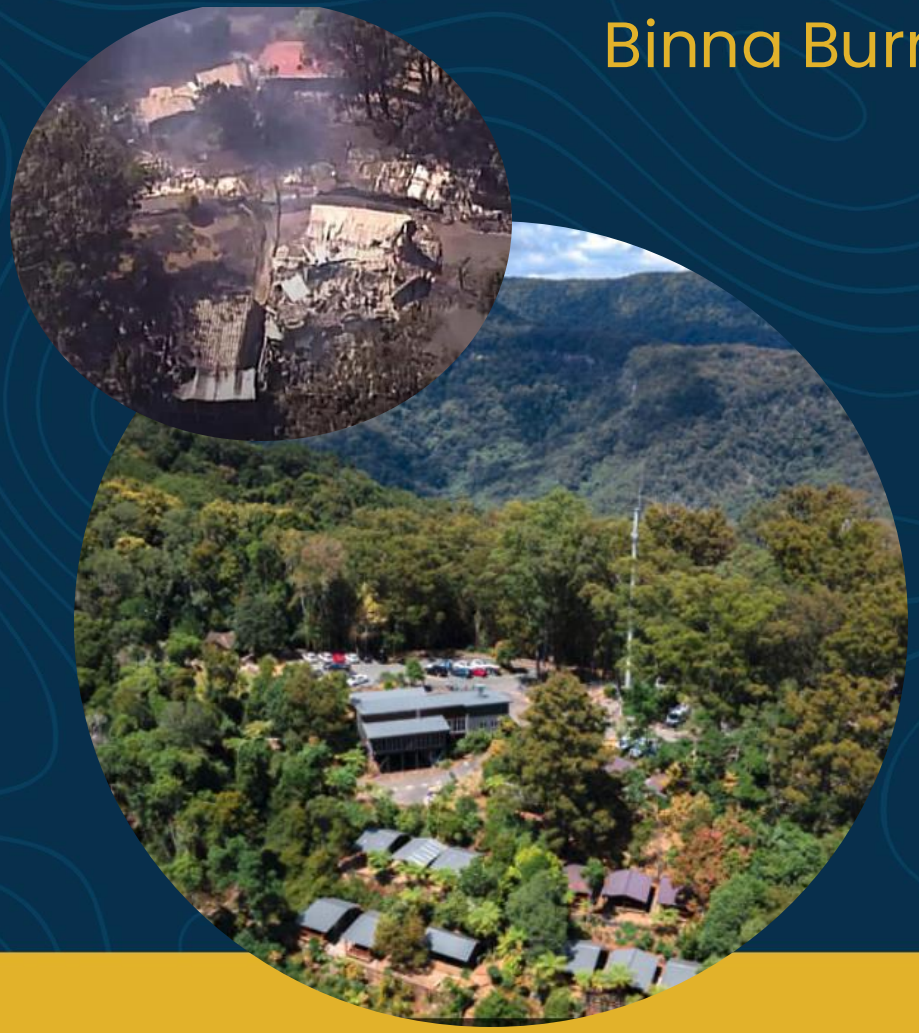
3100

18

Source: Viviene Reiner (Phd), 2024: University of Sydney, Centre of Integrated and Sustainability Analysis Published in Economics of Disasters and Climate Change.

https://www.youtube.com/watch?app=desktop&v=ZOUID754K8U

Outdoor Sector Impacts



Binna Burra Lodge, Lamington NP, QLD

- 86 year-old heritage rainforest lodge lost, September 2019
- Cancelled school camps and outdoor tours
- $5 million+ local tourism losses
- Trail closures in Lamington National Park

- >$20m government funded rebuild

OUTWARD BOUND AUSTRALIA EST 1956

Nat CORR

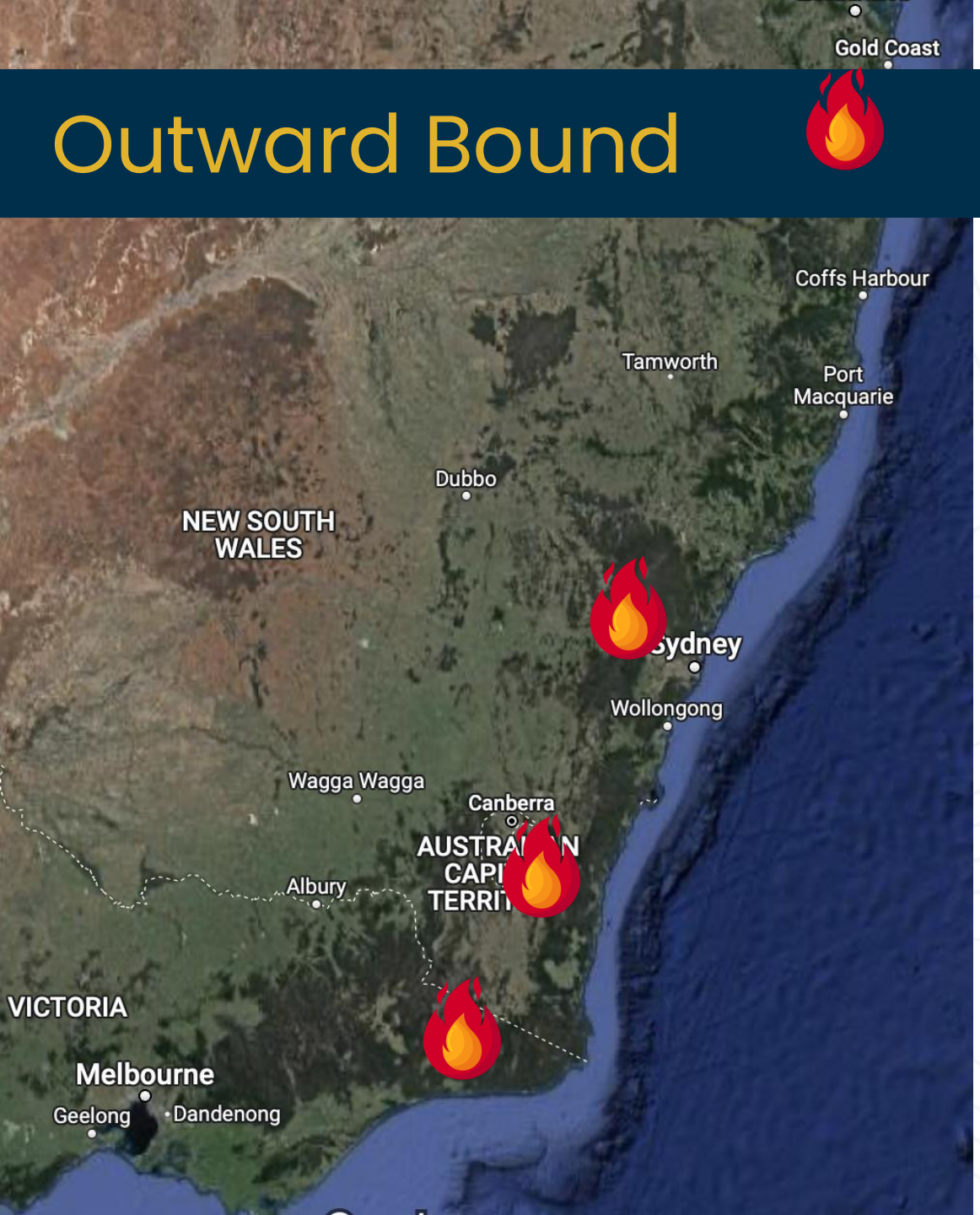
Outdoor Sector Impacts

Kangaroo Island (SA) 2019-20

- 46% of the island burned; 25,000+ koalas lost
- Flinders Chase National Park
- Southern Ocean Lodge destroyed - $50m rebuild with US Capital
- Hiking trails and campgrounds closed for ~2 years
- 50+ tourism businesses affected; $100M+ in economic loss

Photos: Southern Ocean Lodge ; TourKangarooIsland

Outward Bound Fire Impacts



UKI Northern NSW
November 2019

Wolgan Valley, NSW
December 2019

Tharwa, ACT
February 8-9 2020

Buchan, VIC
December 31 2019

UKI – Northern Rivers NSW

- Packed up and left
- Paid out lease
- Have not returned

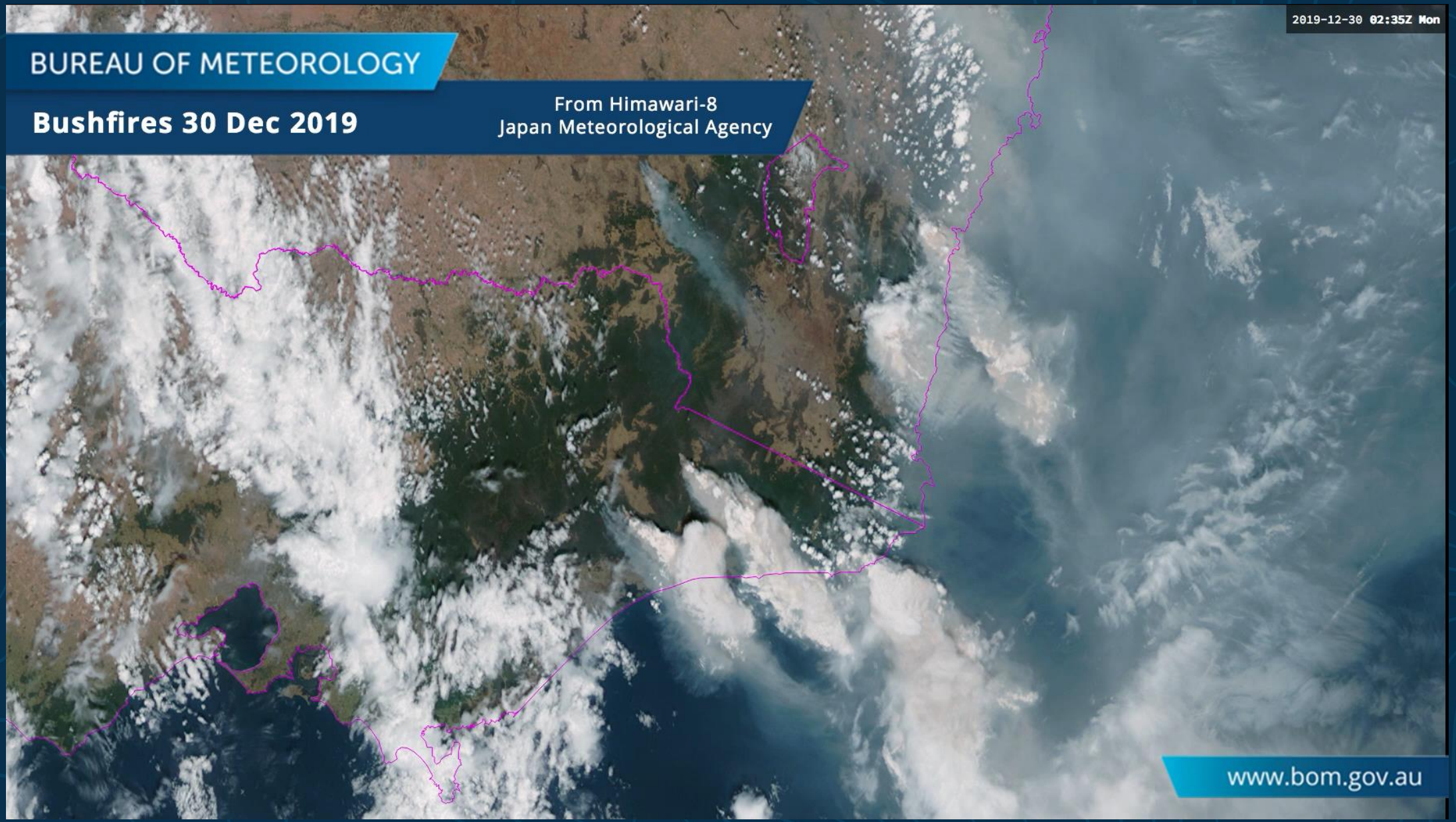
Wolgan Valley, NSW

- $15k Bushfire Impact assessment
- Road access closed post 2023 flooding
- Not been back

Snowy River, Vic

- House and outbuildings burnt
- Locals lived in our shed for 12 months
- No programs for 18 months
- $400k fed grant for recovery
- $11k Vic grant for compost toilets

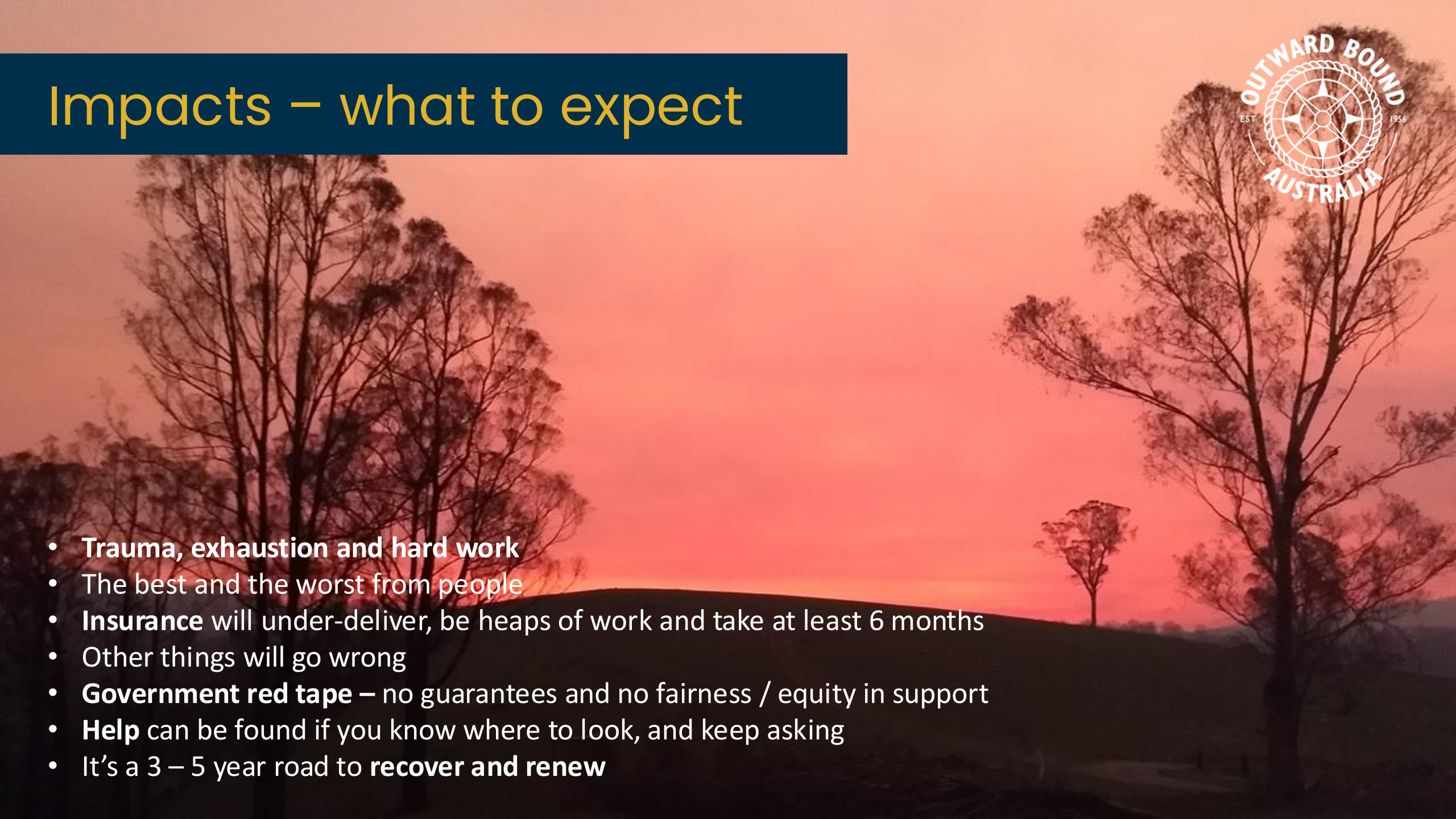
- Use only half of previous area
- Blackwood wattle regrowth extremely thick


BUREAU OF METEOROLOGY
Bushfires 30 Dec 2019
From Himawari-8
Japan Meteorological Agency
2019-12-30 02:35Z Mon
www.bom.gov.au

Tharwa, ACT

- 80% Namadgi NP burnt, closed ~1 year
- Programs ran across Booroomba Station
- Orroral Valley road closed
- The bush isn't the same
- Investing in campus for diversification
- ~$800k recovery grant and $500k loan

Impacts – what to expect



- **Trauma, exhaustion and hard work**
- The best and the worst from people
- **Insurance** will under-deliver, be heaps of work and take at least 6 months
- Other things will go wrong
- **Government red tape –** no guarantees and no fairness / equity in support
- **Help** can be found if you know where to look, and keep asking
- It's a 3 – 5 year road to **recover and renew**

Outward Bound's bushfire experience seeded NatCORR

- To help prepare outdoor practitioners to continue to safely operate in increasingly volatile weather and environmental conditions face of a changing climate.

Climate & Disaster Risk Assessment Template

Climate & Hazards

- What are the climate & natural disaster hazards that present risks to your organisation?

Exposures

- What elements are you exposed to?

Vulnerabilities

- Where / how / when are you vulnerable? In what way?

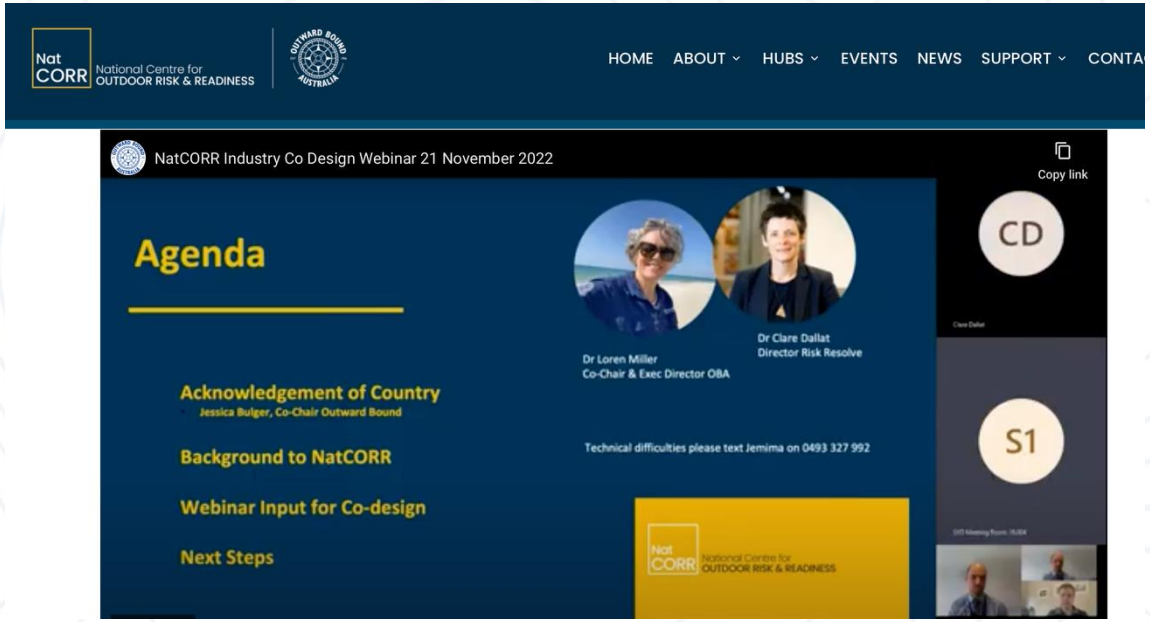
IMPACTS AND RISKS

- How might these affect you and your organization?
- What might you need to do differently?
- What would the impact be if the risks eventuate?

2. Building Resilience

NatCORR - Outdoor sector engagement for climate change readiness

NatCORR co-design webinars and surveys



Webinar recordings are available on the NatCORR website or on YouTube

Top Priorities for Action

Priority Rating /100

Weather & Conditions

76% Training and PD programs on weather, fire, flood and changing environmental

75% Work with BOM, land managers, disaster management and other agencies to improve access to local information.

Risk & Incident Management

75% Deliver scenario and risk management training services.

74% Develop community of practice, promoting news, events and participation through networks.

74% Collate a panel of experts and risk management providers to support incidents and disasters.

Finance & Insurance

77% Identify insurance issues and needs. Facilitate efforts to support affordable insurance.

73% Improve training support to develop resilient financial management and disaster support

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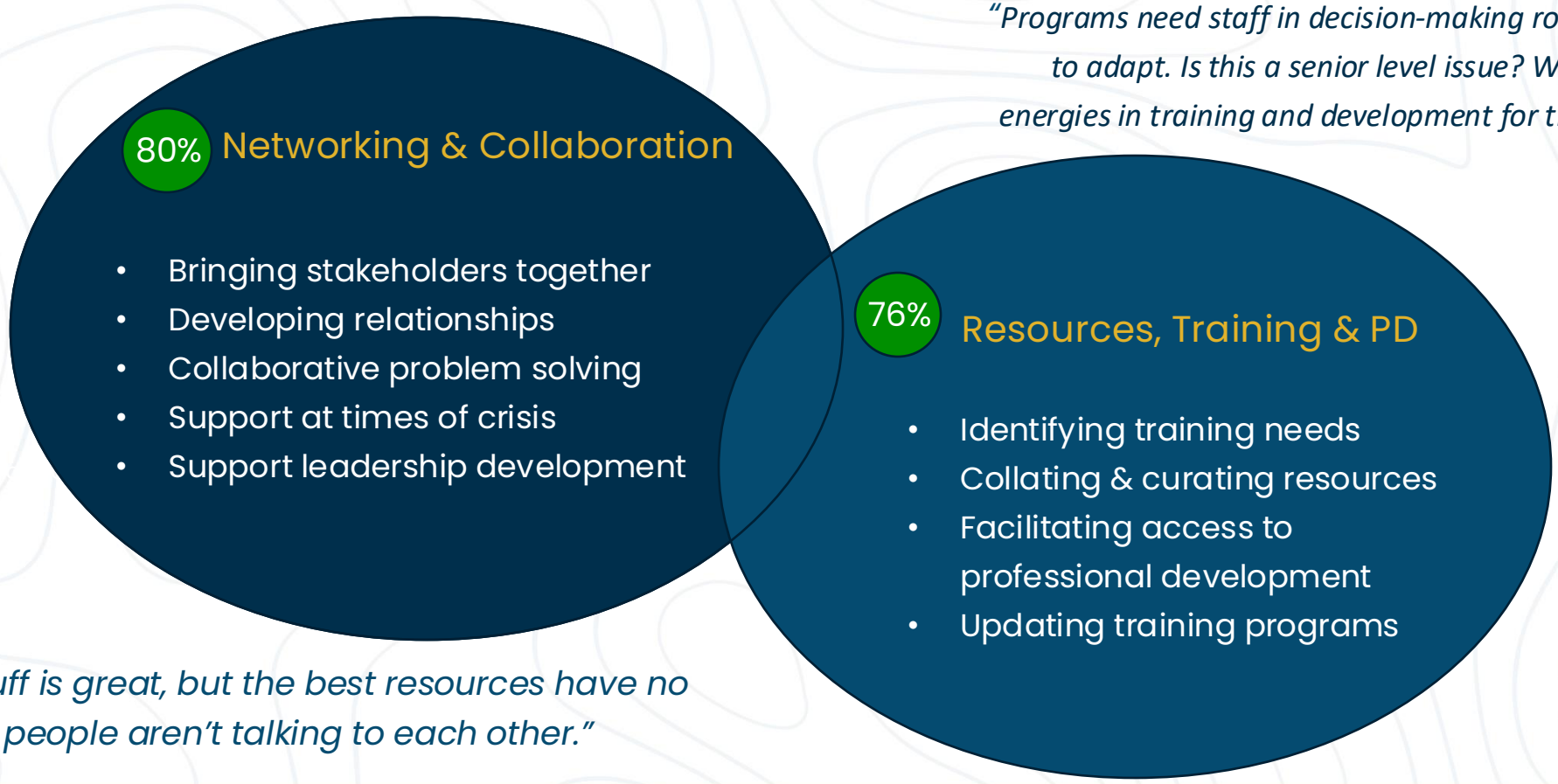
Type of Activities Needed

Need Rating /100

Highest rated activity needs

"PD wins every time. Can't beat training"

"Programs need staff in decision-making roles to have the skills to adapt. Is this a senior level issue? We spend most of our energies in training and development for the entry level staff."



"The other stuff is great, but the best resources have no value if people aren't talking to each other."

NatCORR Program 2025

ORI Outdoor RISK INTELLIGENCE

Outdoor Risk Intelligence Platform

ORI Track
Incident & Business disruption reporting & analysis

ORI Heat
Heat Forecasting & Risk Management

THE UNIVERSITY OF SYDNEY

ORI Air (TBC)

Nat CORR National Centre for OUTDOOR RISK & READINESS

Professional Development Program

Weather Workshops
In-person
APRIL

The Bureau of Meteorology

Outdoor Risk & Resilience **Symposium**
In-person
JULY 9

Celebrating 40 Years Outdoors NSW & ACT

Nat CORR National Centre for OUTDOOR RISK & READINESS

Online Resources

Nat CORR National Centre for OUTDOOR RISK & READINESS

Consulting Services

Bespoke Program
Blackwood Specialist School

RISKRESOLVE

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Understanding Disaster Resilience

National Emergency Management Agency

Source: NEMA Presentation, Natural Hazards Research Forum 2025

Situational Awareness

- Do we have a culture and practice of observing, reporting and asking questions about any changes?
- Are we actively thinking about the interactions between weather, landscapes & participants?

Weather

Landscapes

Participants

Weather – action agenda

For the Outdoor Sector

Develop training in weather decision support

- <25% had training in weather in the last 5 years
- >100 sources of info

Build a community of outdoor weather experts to track and share learning

Engage with researchers for learning and publication

Consider thresholds guidelines in review of AAAS ?

Highlight and lobby for outdoor sector needs in weather forecasting?

Improve communication between the BOM and the outdoors sector

For the BOM

Timely updates of weather warnings

Addition of lightning alerts on BOM

More stations to improve local forecast accuracy in outdoor recreation settings

More attention to, and tailored services for the outdoors sector

- Meaningful wording
- Avoid unnecessary cancellations

Improve ease of access to BOM information

Consider National approach or less fragmentation of information

Training on how to find / use BOM services for the outdoors sector

The use of thresholds varies by type and level

"It would be nice to see what other company policies are and what their cancellation thresholds are."

"Clear trigger tables as a baseline would help new outdoor leaders."

Example Thresholds by Type

Extreme Heat

35C activities pause – seek shade or water

35C stop activities

> 35C cancellation

34C forecast

30C review

28C modify, 35C no activity

>26C no walks

Two consecutive days BOM forecast >40C - cancel

Audible thunder

Lightning within 50km

Lightning procedure

No canyoning if severe thunderstorms forecast

Heavy snow falls

Gale force winds

>90km/h forecast

40km/h winds

Wind warning 50km/h land, 20km/h water

>35km/h winds

Gale force factor 7

No camping in high winds

Beaufort 4 - 5

>10 knots

>14 knots on water

>15 knots for kayaking

17 knots modify water activities, 22 knots cease water and modify land, 28 knots cease land activities

Swell reports

Cyclone

Predicted rainfall >100mm for one day within water catchment area

Avoid activity after >50mm rain

50-mm watch/modify, >100mm cancel

>10mm no walks

Flood warning

Strict river level guidelines when to cancel water activities

River height cut-offs

River height triggers

Cancel or re-arrange if can't pass creeks in vehicle, at defined mm rain

Bushfire code red. Bushfire threat

Code red

Bushfire rating for evacuation

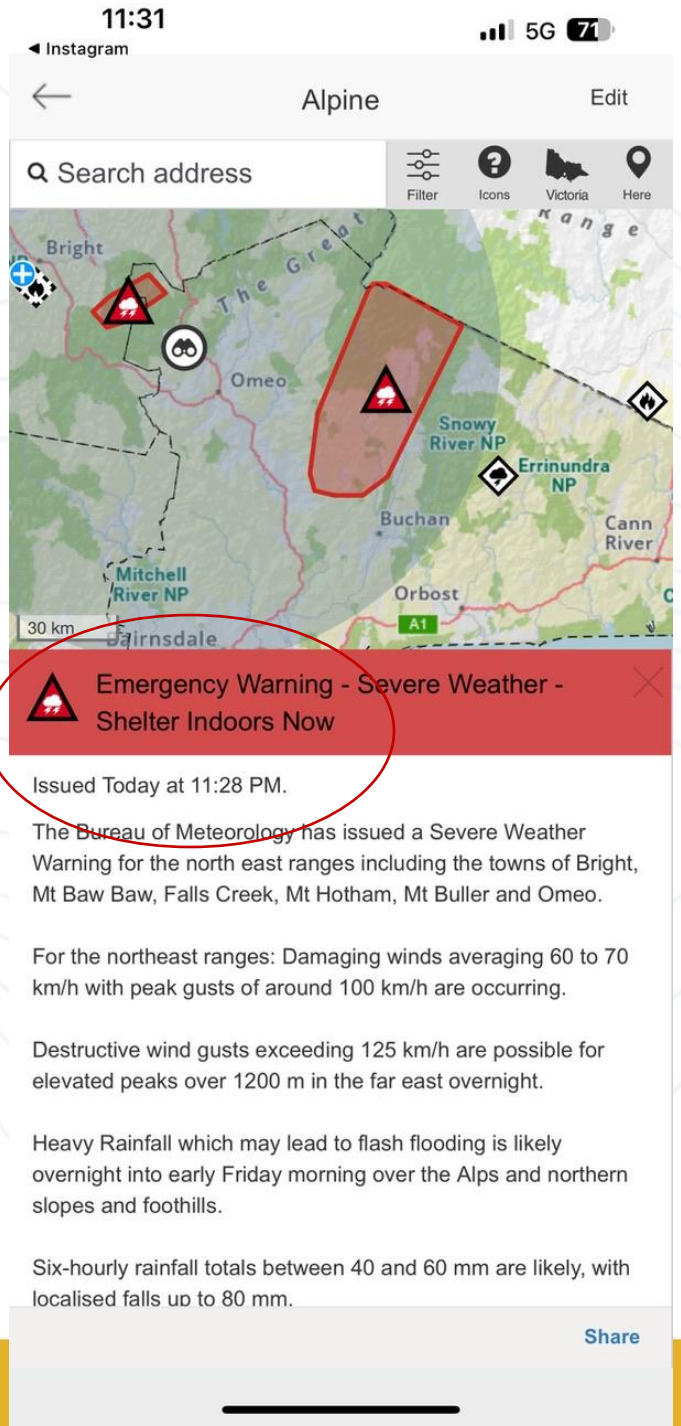
Extreme fire danger, trips cancelled

Catastrophic fire danger requires event cancellation

Total Fire Ban – all activities cancelled or a safe location used

Total Fire Ban – school cancels all activities

A fire classified as 'out of control' <20km of operating area. Or within 50km if wind could direct towards sites. Rating of Catastrophic or instruction by authorities to evacuate



For example…

What do you do when an SWW is issued at **11.28pm?**

VICEmergency 30th May 2024

Situational Awareness

CHECKLIST

Weather

- Do we use up to date climatic and seasonal forecasts to inform program and activity planning?
- Are we up to date with best practice in accessing weather forecasts?
- Do we attend & provide regular PD on weather information tech, access and interpretation?
- Do we have formal processes for monitoring weather & conditions prior to and during programs?
- Do we have thresholds and use professional judgement to inform decisions about adapting to weather conditions?
- Do we have a relationship with weather experts to access advice and inform innovation?

Landscapes

- Is our information on the area up to date? (e.g. maps, closures, conditions, works schedules)
- Do we know the natural disaster risk profile of the area?
- Have we risk assessed road access, campsites, trails, rivers & waterways? When? How often?
- Do we have thresholds for safe operations in the area (temp, wind, SWW, rainfall)?
- Do we have an active relationship with local land managers (and other locals)? Do they know where we are and what we do?
- Do we know shelter points, evacuation routes, alternative adaptive options?

Participants

- Does our booking form / consent / medical declaration capture information to support participant risk assessment & awareness?
- Is there information provided for informed consent – including disaster risk, or adaptive plans?
- Is there potential participant agency if risks change during activities?
- Is support available to accommodate individual special needs if risks eventuate?
- Are there communication plans in place to share information / consent for adaptive plans or cancellation?
- Are there practices to observe, assess and check participant well-being in changing risk contexts?
- Do we know how decisions will be made to manage duty of care if risks eventuate?

Operational Response & Innovation

- Are we actively seeking new ways to improve our critical response capacity, communications and gear to be more prepared for disasters?
- Are we investing in innovation and engaging with supply chain innovators?

Critical Incident Plan
- Operational
- Organizational

Communications

Tech / Equipment

Critical Incident Plan for Organisational Resilience

CIP for Organizational Resilience

1. Regulatory investigation reporting and liaison
2. Business continuity and future client impact
3. Reputation management
4. Staff impact
5. Cashflow forecast
6. Bank Communications
7. Insurance
8. Government relations
9. Legals

Each need a task list
and a role allocation

ONE PLANET

Group Shelter Tarps

- Silver UV reflective side
- Blue rain resistant side

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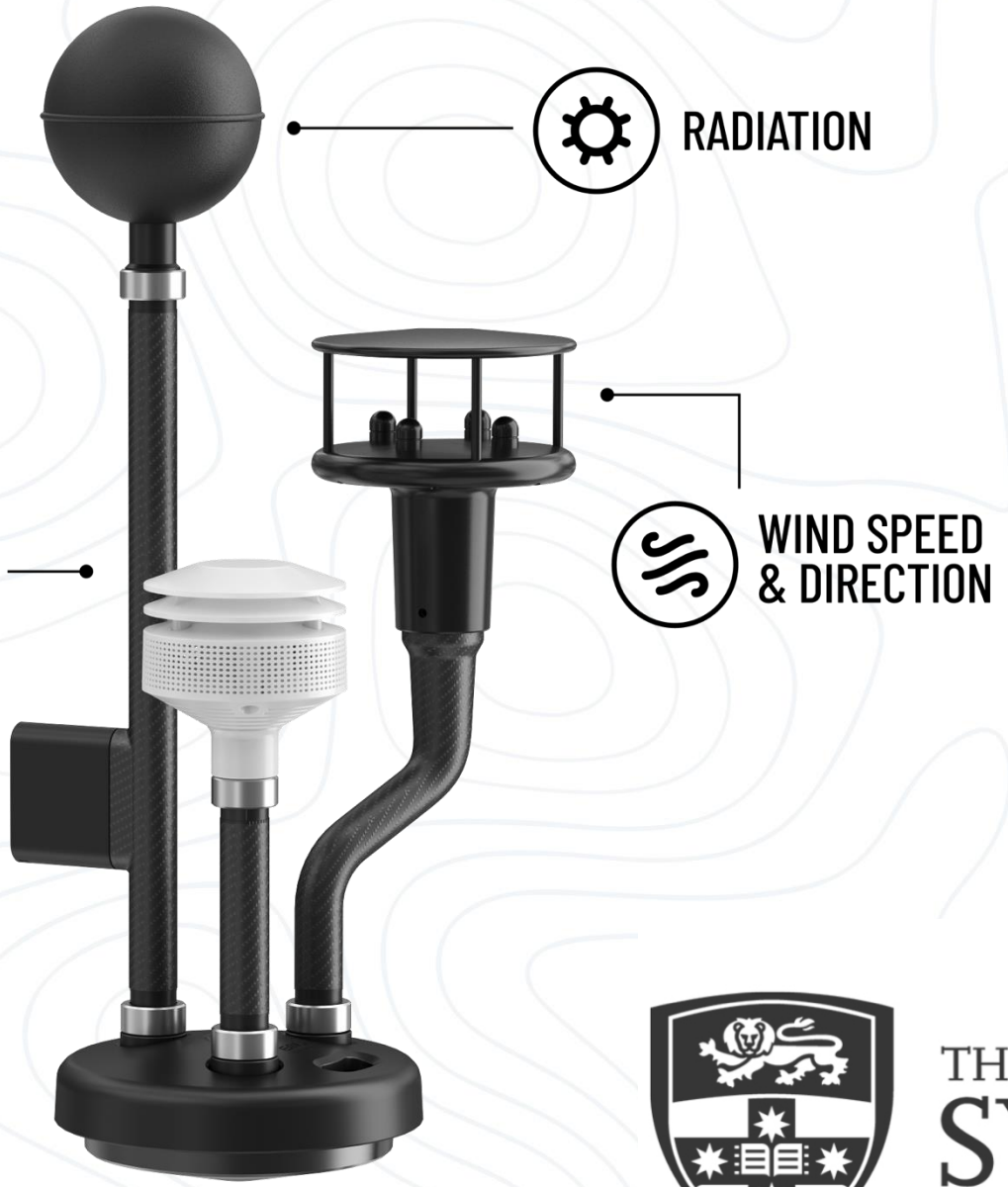

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Outdoor
RISK INTELLIGENCE

ORI
HEAT

THE UNIVERSITY OF
SYDNEY

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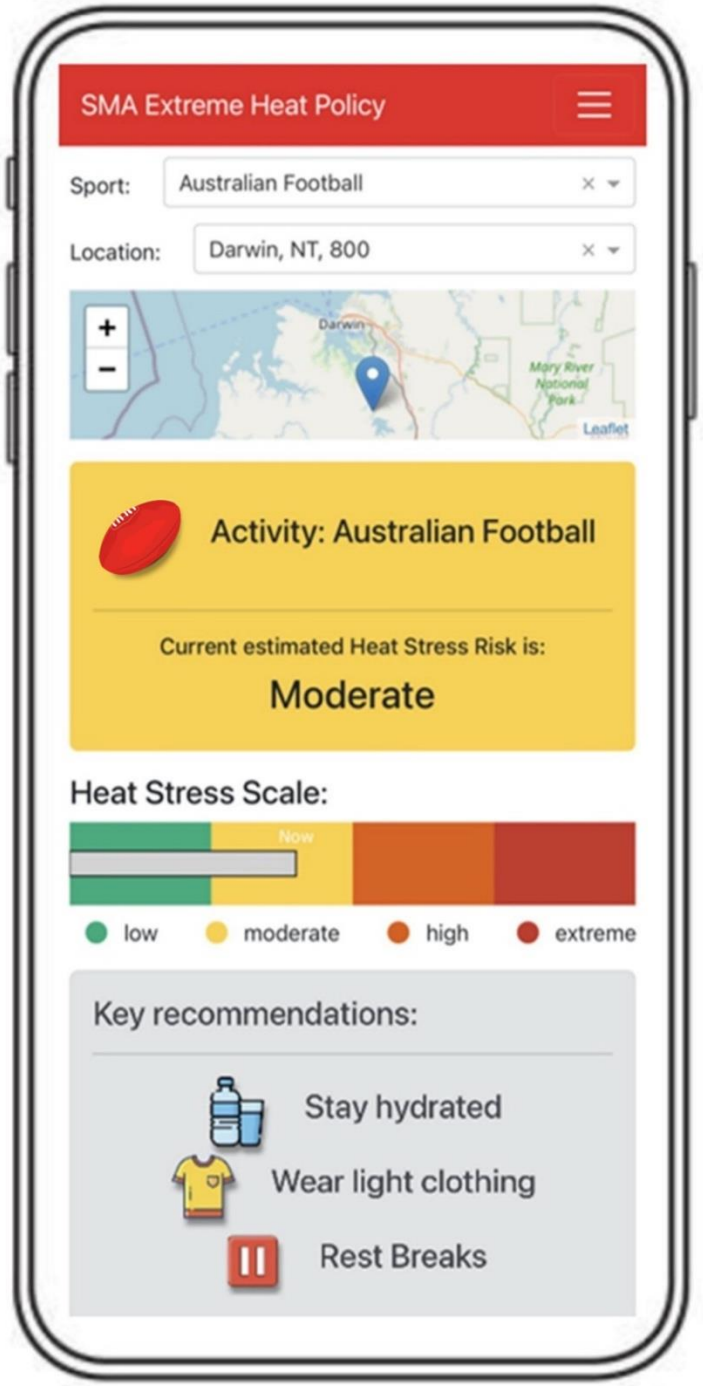
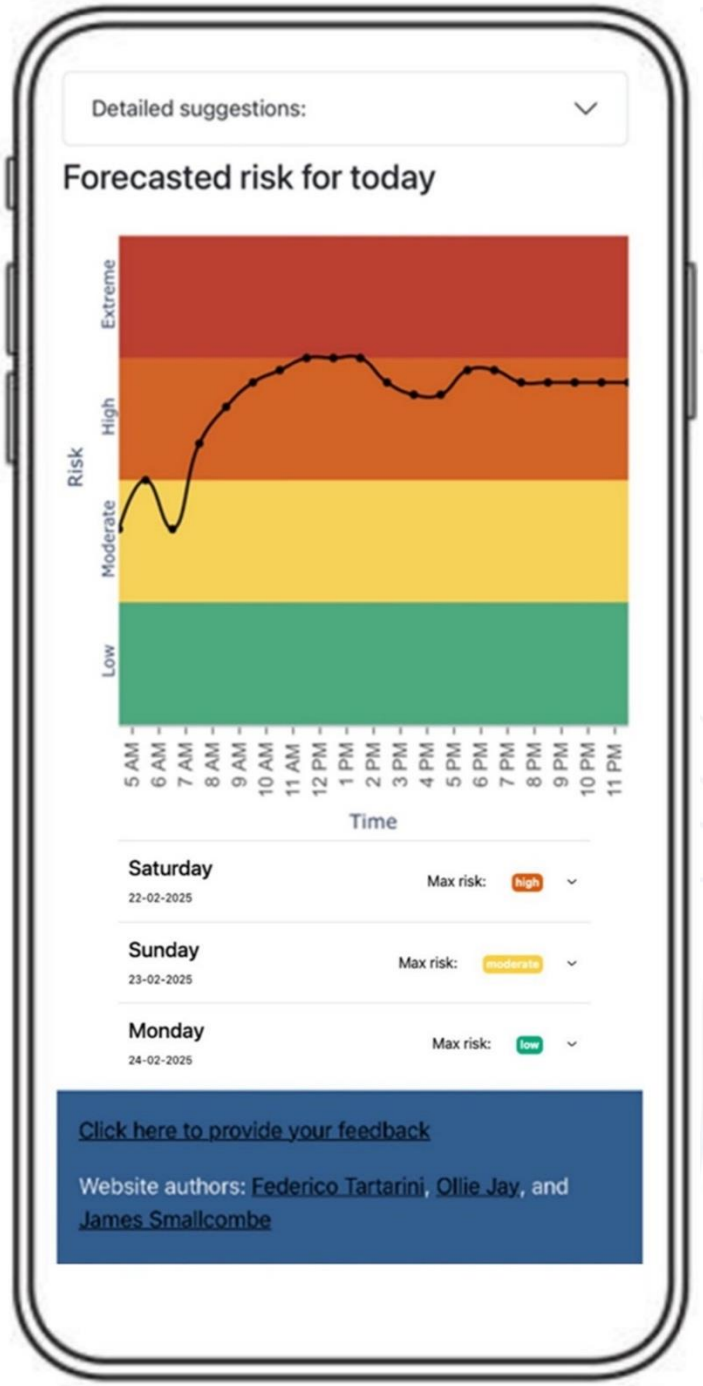




afac
powered by INTERSCHUTZ

SOLUTIONS THEATRE

afac25
powered by INTERSCHUTZ

Introducing Connected Hydration

- Wearable patch sensor + mobile app + cloud dashboard
- Monitors sweat rate, sodium loss, fluid deficit in real time
- Sends alerts at 500 mL sweat loss and 2% body fluid loss
- No cellular or Wi-Fi needed for on-site use

EPICORE BIOSYSTEMS
AES sensing safety

5

28 August 2025

Operational Response & Innovation

CHECKLIST

Critical Incident Plan

- Do we have clear SOPs defining incidents and supporting response?
- Do we have an operational Critical Incident or Emergency Management Plan to guide a response to incidents or disasters?
- Do we have an ORGANIZATIONAL Incident Plan, to enhance the resilience of your organization in a crisis?
- Do we regularly practice a wide range of scenarios to test CIP capacity? Do we practice with partners and know their SOPs?
- Do we have sufficient expertise & resources to enact our CIP?
- Do we have good relationships with emergency services and know what to expect and their limitations?

Communications

- Is our comms tech fit for purpose?
- Are we sourcing & tracking the best information sources for disasters?
- Is there redundancy / resilience in our communications mechanisms?
- What will we do if internet / mobile communications go out? Have we practiced this scenario?
- Does our communications policy consider disaster risk management?
- Have we pre-prepared templates for disaster risk comms?
- Can we access stakeholder contacts for rapid comms distributions?
- Are there comms protocols for working with partners?
- What values will our comms prioritise, care or liability limitation?
- Do we know who is responsible and what role people will play in communications?

Tech / Equipment

- Are our digital systems up to date for risk management? Are they defendable should things go wrong?
- Are we considering unplanned for extreme conditions in equipment selection and gear/clothing lists?
- Have we different / additional gear we can deploy if sudden change in conditions (shelters, clothing, water drops?
- Do we talk with gear suppliers about performance requirements and emerging needs?
- Are we or should we invest in gear diversification (eg large/small rafts, tents v bivvies)?
- Do we monitor client / market expectations on gear provision to align with societal expectations?

Informed policy & strategy

- Are we actively planning for a future that will succeed with more challenging climate and disaster risks?
- Are we participating actively in sector relationships with the government to support safe and effective regulations for risk management?

Strategic Planning

Regulations

Sector – Government Relationship

Are we expecting someone else do the thinking?

Professional Development: Managing Finances for Resilience

1. Balancing Investments with Reserves
2. Reserves Policy
3. Cashflow Forecasting
4. Terms of Business
5. Employee Obligations
6. Bank Relationship
7. Other Realisable Assets
8. Government Grants / Support

Informed policy & strategy

CHECKLIST

Strategic Planning

- Does our strategic plan assume BAU, or has it considered increasing natural disaster risk?
- What strategic options are available to mitigate emerging risks?
    - Diversification
    - Exit high risk areas/activities
    - Plan for more seasonality
    - Invest in building resilience
- Do we have a culture that is open to change, and is adaptable?
- Have we considered what level of potential business disruption should be incorporated into the strategic plan?
    - By area, program type?
    - Financial reserves level?
    - Workforce plan?
- Do we monitor and report organizational risk and resilience in our governance framework?

Regulations

- Are we aware of the trends in regulations for risk mitigation:
    - Workforce health & safety
    - Operational standards
    - Facility & equipment registration & inspections?
    - Closures, bans, thresholds?
- Do we review our compliance and check that our policies and practices are up to date?
- Is there a culture of accepting limitations, or do we continue with current practices?
- Do we report any breaches if required?
- Are regulations working effectively to help mitigate risks? Is there a need to lobby for review and change?

Sector- Government

- Do we have peak bodies that help to co-ordinate our interests and engage with government and other stakeholders?
- Do we regularly engage and contribute to the work of peak bodies to ensure that it is forward thinking and adaptive?
- Are the peak bodies interested in climate and disaster risk and prioritizing work on this agenda?
- Are their effective relationships with policy makers to engage on outdoor sector needs?
- Are there good connections and relationships between the outdoors and the disaster resilience and emergency management sectors?
- Is this load shared – or do more people need to contribute?

Learning From Disasters

- How are we capturing information and lessons from incidents and disasters ?
- How can we make sure we are sharing this learning to help risk mitigation?
- Is there a culture of assuming a ‘one-off’ (eg 1 in 100 year event) and expect things to return to ‘normal’?

Data Collation

Reviews & PD

Networks

National Outdoor Risk & Resilience Symposium

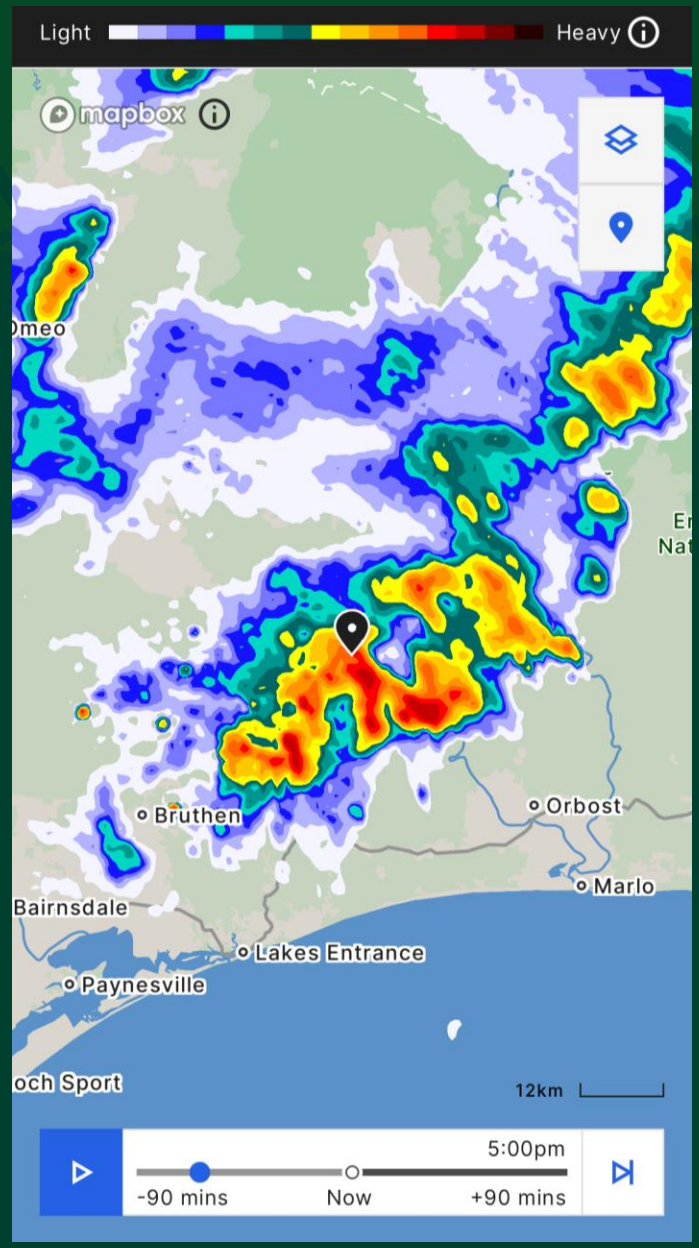
July 2025

Buchan - One in 200 year flood?

- Immediate action was focused on the idea that a flood of this scale would not happen for another 200 years

However…

- Post flood, Buchan received severe thunderstorm warnings over the next summer period.
- 1 year post flood we had our first severe thunderstorm with heavy downpours
- We weren't prepared enough



Buchan - Getting prepared for the next event

- New local ‘Hazard Guide’ developed and discussed with entire team.
- Regular staff meetings about preparedness – upcoming weather events
- Communication improvements
- Assembly points

Things we’re still working on;

- What an Emergency Management Plan does not do, when it is triggered.
- What happens after hours when no staff are on site

Learning From Disasters

CHECKLIST

Data Analysis

- Do we collect organization safety and incident data to reflect on trends and learning?
- Do we encourage reporting incidents and near misses without fear of blame?
- Is there a national or outdoor sector wide mechanism for collecting and collating information about incidents?
- Are we curious about change?
- Are we utilizing digital systems to support rich information collection and analysis?
- Do we connect with other sectors with similar contexts and issues?
- Are we connecting with researchers?
- Are we connecting with international organizations for trends and information?

Reviews & PD

- Do people feel safe to share experiences and provide feedback following and incident?
- Are there considered reviews inclusive of all stakeholders following a disaster – at an organization and sector level?
- Are the outcomes of reviews shared and do they typically inform changes in practices?
- Are learnings and changes in practices shared with practitioners through professional development?
- Do regulators or government invest in sector or disaster wide reviews to inform policy & regulatory development?

Networks

- Are people interested and engaged in talking about disaster risk?
- Are there known 'experts' building knowledge and experience available for advice on different risk areas?
- Is there a culture of sharing and support between people and organizations?
- Are there conferences and networking events providing opportunities for learning from disasters?
- Is there active engagement between research academics and practitioners to link research, disaster learning and future practice?
- Do we have relationships with people to call if we need help?
- After a disaster, do we offer help to others?

Resilient Communities

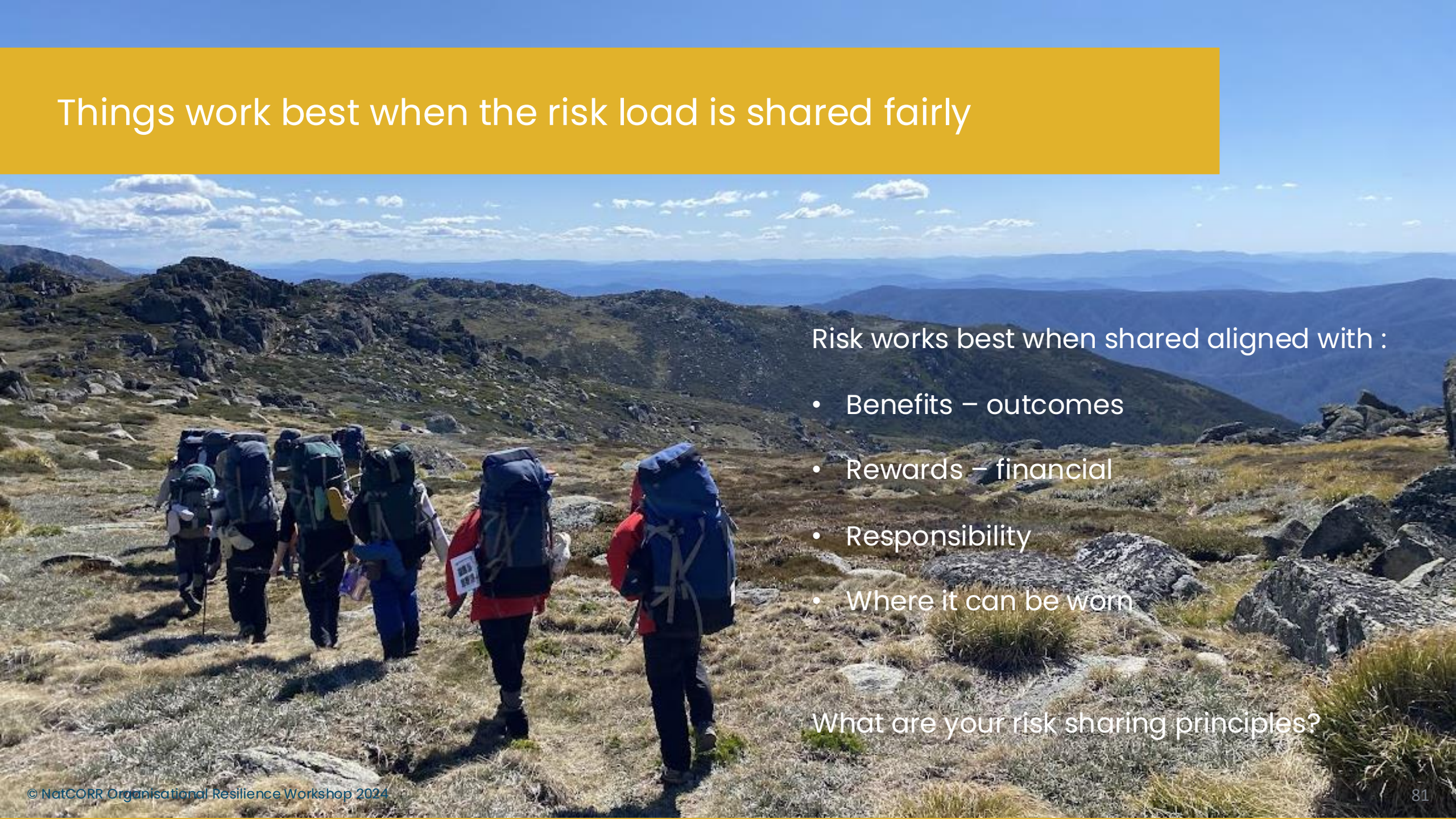
- Do we value and develop people for resilience?
- Are our organizational performance metrics set to value resilience – or other short term or profit KPI priorities?
- As a sector – do we value collaboration? Do we trust one anther to share our vulnerabilities?

People

Organizations

Outdoors Sector

Things work best when the risk load is shared fairly

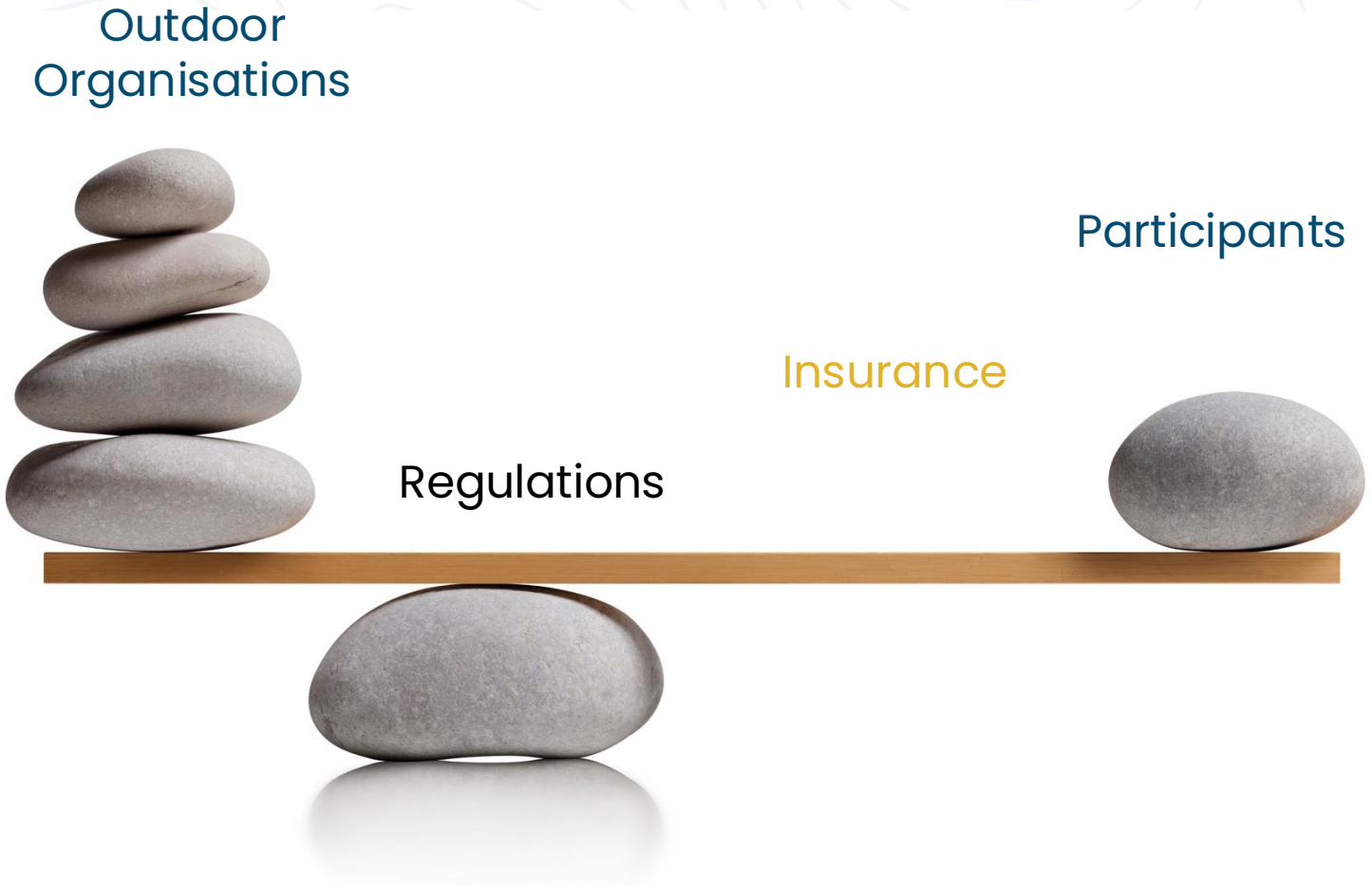


Risk works best when shared aligned with :

- Benefits – outcomes
- Rewards – financial
- Responsibility
- Where it can be worn

What are your risk sharing principles?

It feels like risk is stacking up on outdoor organisations



What is your organisational risk profile?

A risk register can track organisational risk

- Exec and Board input
- Strategic Risk areas and risks
- Mitigating controls (track)
- Rating of Likelihood, Impact & Residual Risk
- Rating of Risk Appetite
- Update quarterly / half yearly

Strategic Risk Area	Risk #	Risk	Mitigating Controls (owner, due date, status, effectiveness)	Likelihood	Impact	Residual Risk	Risk Appetite
Financial Resilience	1	Business disruption due to economic, regulatory or environmental contexts		Med	Extreme	Med	2
	2	Inadequate insurance to cover risks		High	High	High	2
	3	Unviable business model - costs inflate without revenue alignment		Med	Med	Med	3
	4	Building program cost blow out, insufficient access to capital/funds for ongoing building investment		Med	High	High	4
Organisational Capacity Building	5	Positioning of improved HR conditions not sufficiently effective to support retention and recruitment		Low	Med	Low	3
	6	Not enough appropriately qualified and experienced field staff to meet program delivery demands		Med	High	Med	5
	7	Failure to development of culture, values and morale aligned with organisational vision and growth		Low	Med	Low	5
	8	Business processes are not as efficient and professional as needed		Low	Med	Low	3
Ops and Program Delivery	9	Critical incident or injury in the field		Low	Extreme	Med	2
	10	Climatic, environment and weather risks disrupt operational delivery and increase costs		High	Extreme	High	2
	11	Land / area access closures disrupt operations and increase costs / resoursing demands		High	Med	Med	2
	12	Equipment and fleet - quality / quantity not fit for purpose or meeting professional standard		Low	Med	Low	5
	13	Facilities are not sufficiently maintained to operations standards - food, accommodation and program delivery		Med	High	Med	5
Business Development	14	Loss of clients and reputation impact of sub-standard program and client service delivery		Med	High	Med	5
	15	Not optimising calendar scheduling to capacty		High	High	High	4
	16	Too limited portfolio of program offering - need to expand offering for seasons		High	High	High	2

Community action on disaster preparedness

Drawing on theories of community development and theories of change

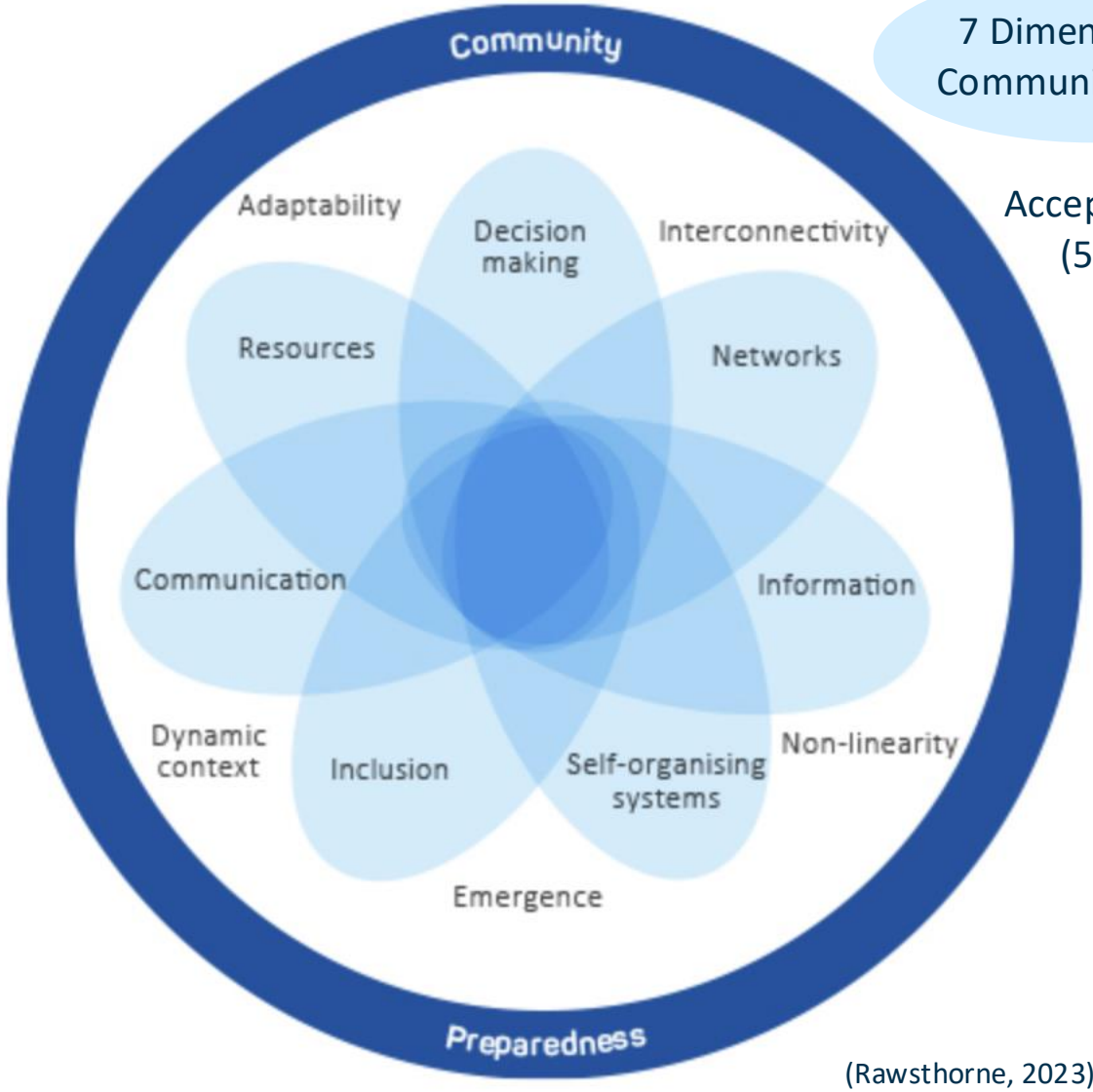
Benefits:

- Shared responsibility
- Relational lens
- ‘Feel for the Game’

(Rawsthorne & Howard 2013), (Oliver & Pitt 2013)

Succeeds when:

- Communities can express their needs and influence decision making
- Local knowledge and participation are connected with formal responses
- Builds on existing community strengths



7 Dimensions of Community Action

Accept Complexity (5 Concepts)

(Rawsthorne, 2023)

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Women are 14 times more likely to die in a climate disaster than men, highlighting the gendered nature of climate impacts

(The Conversation, 2024).

Who is GADAus?

Gender and Disaster Australia (GADAus) is the leading national organisation working at the intersection of gender and disaster.

- We conduct research focussed on the experiences of women, men and LGBTIQA+ people in a disaster context.
- We provide Lessons in Disaster training for people working across the disaster and emergency management sector.
- We develop key resources such as the Gender and Emergency Management Guidelines.
- We work in partnership to improve inclusion and reduce the harms experienced by women, men and LGBTIQA+ people before, during and after disaster.

What is the problem we are solving?

"Rural firefighting and emergency management in Australia are not only structurally dominated by men—they are also culturally embedded with dominant constructions of masculinity."

— Tyler & Fairbrother (2014)

- A tendency to prefer telling over collaborating ('doing to') can lead to exclusionary practices, preventing the inclusion of diverse perspectives
- The valorisation of toughness and stoicism across our society often results in marginalisation or devaluing of emotional responses and care roles, which are vital for supporting mental health and wellbeing in post-disaster scenarios.

https://genderanddisaster.com.au/wp-content/uploads/2023/10/GADAus-Men- Masculinities-and-Disaster-Literature-Review-.pdf

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Resilient Communities

CHECKLIST

People

- Do we build and value resilience in our workforce training and recruitment?
- Are we losing people to the outdoors sector after an incident or disaster – or because the risks are stressful?
- Do we provide sufficient support for people to be prepared and ready to manage risks and responsibilities?
- How are we navigating generational changes in expectations and resilience?
- Is there sufficient gender diversity in our leadership – to recognize the safety risks, value duty of care and prioritize resilience work?
- Are we thinking about how we can remain optimistic, when there is so much bad news and so many challenges?

Organisations

- Do you balance investment for growth with rainy day reserves?
- Do you have a Reserves Policy?
- How effective is your Cashflow Forecasting?
- Does your Terms of Business consider disaster contexts? Do you and your clients understand it? What principles/ values will drive decisions?
- Do you understand your employee obligations in a crisis? Can you stand down staff? What are your employee liabilities?
- Do you have a good, long standing relationship with your bank?
- Do you have realisable assets for liquidity in a crisis?
- Do you have skills & relationships to access Government grants?

Outdoors Sector

- Is there sector wide awareness and commitment to building resilience?
- Does a peak body champions and co-ordinate resilience building?
- Is there funding for disaster and climate change resilience work?
- Are we sharing and learning from others?
- Are we prioritizing disaster resilience work?
- Are we able to share risks and costs with others in order to have financially sustainable business models?
- Are we regularly checking whether we are ready or not?
- Could we do more – even if it is a baby step?

Key Takeaways

Face our future reality together
Big problems need big brave solutions
Don't wait for consensus or others to lead
Connect with the disaster resilience sector
Look beyond historic organisational constructs
Seek innovative ways for collaboration
Be generous & prioritise time and resources

Capacity and relationship building takes longer than you think!

Thank you

For more information and resources:
www.natcorr.org.au

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Nicola.hanson@outwardbound.org.au

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