

Emergency Management and Prioritisation of Tasmanian Bridge Infrastructure through Rapid Multi-Criteria Assessment

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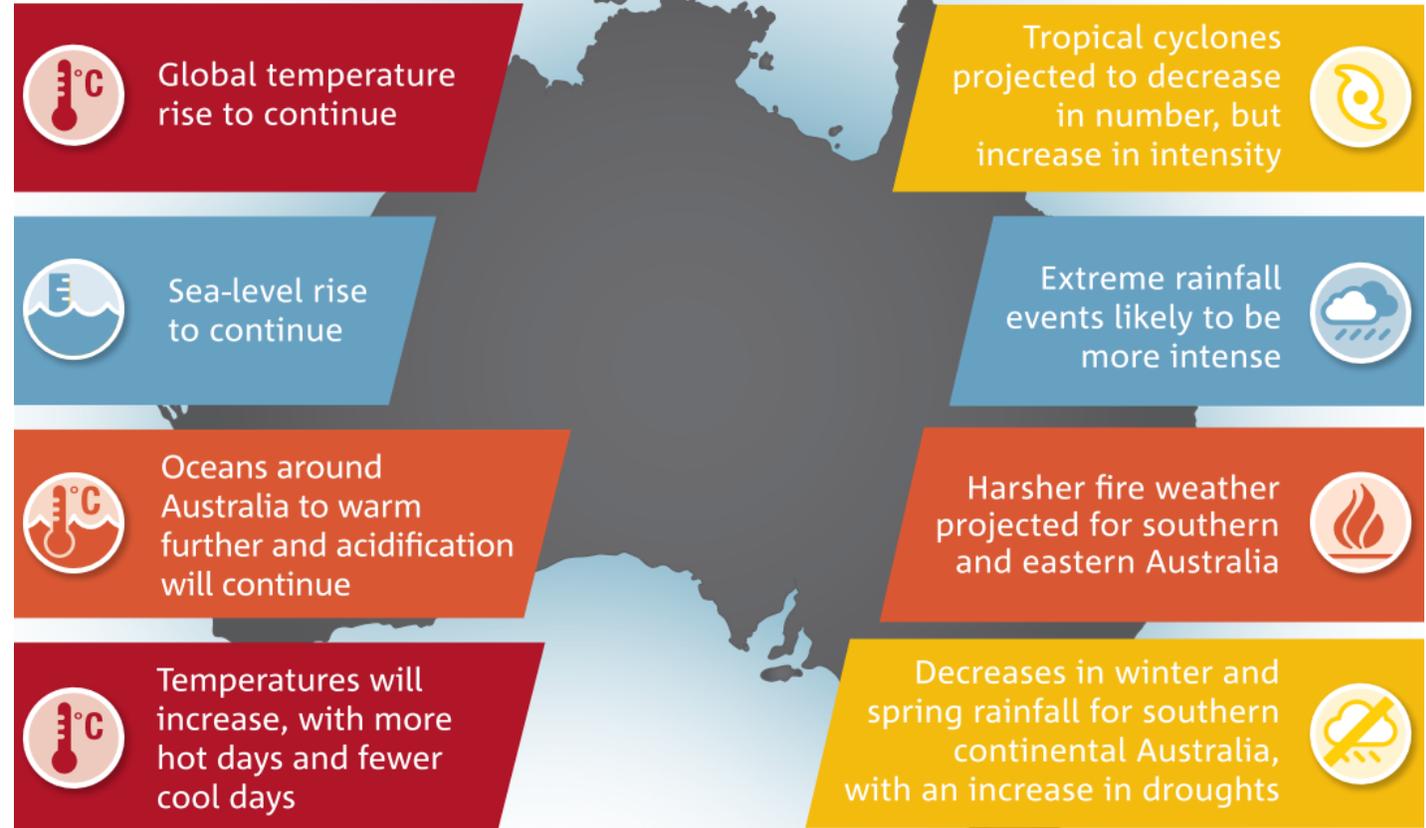


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Bridging Over Troubled Waters

Tasmania's climate future...

- More extreme events such as heat waves, flooding rains
- Flood levels are projected to increase significantly for small flood prone catchments
- Steady increases in fire danger



Source: State of the Climate, BOM 2016



A State of Emergencies

...Communities in Isolation

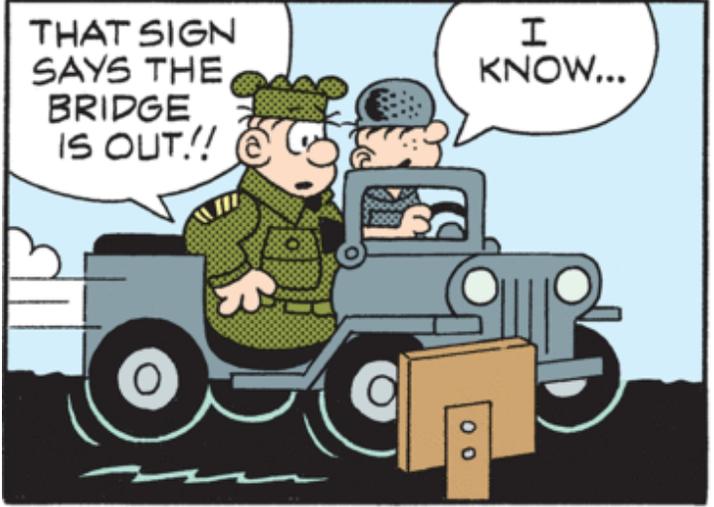
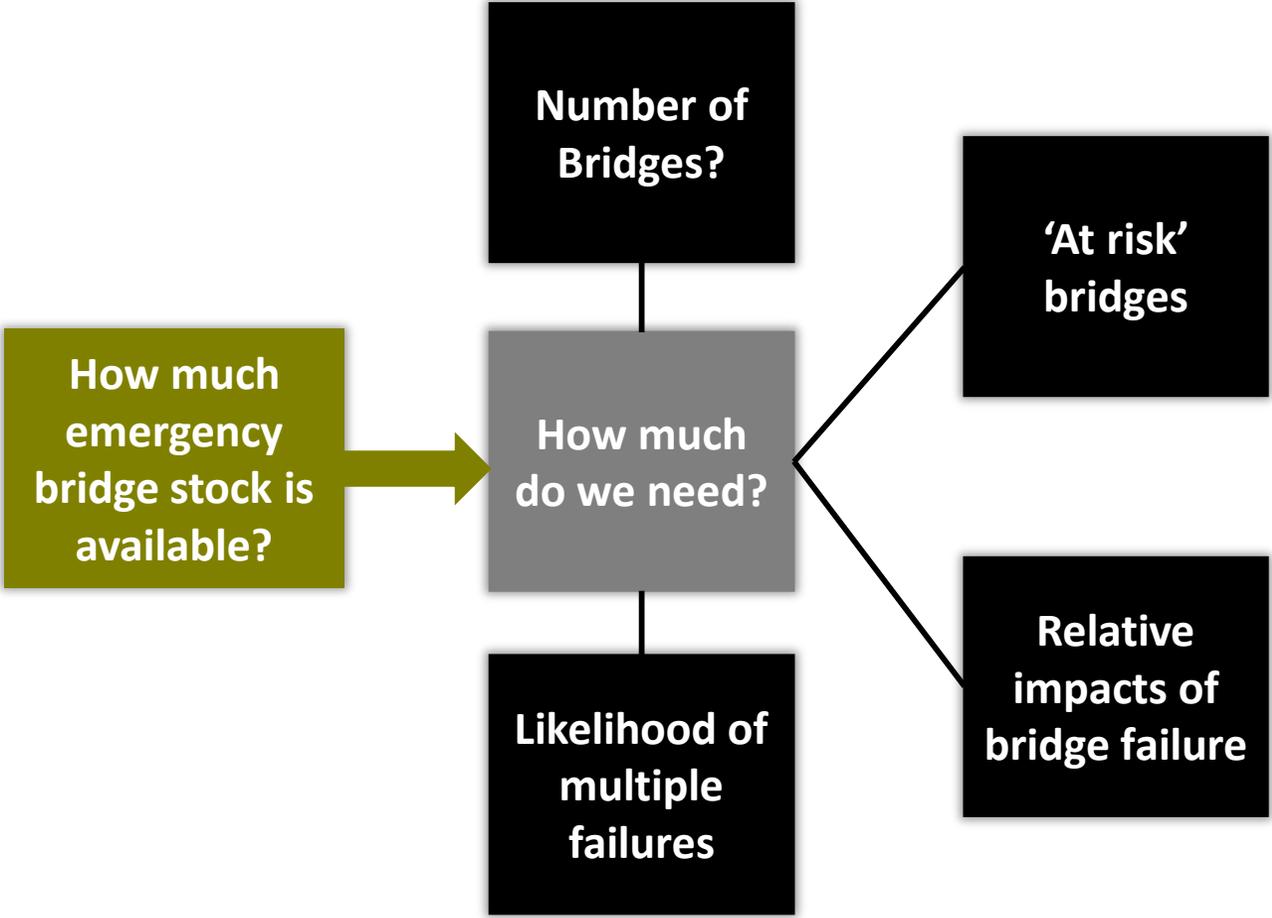
- Dunalley fires, January 2013
- Statewide fires (Central Highlands, West Coast and South West), January 2016
- Northern Tasmania floods, June 2016
- Hobart floods, May 2018
- Statewide fires, January 2019



Source: Google Images, 2019



Bridging the Gap



Source: Greg and Mort Walker



What is Emergency Bridging?

- Pre-fabricated, modular components
- Easily, rapid deployed and assembled
- Steel panel or girder systems
- Floating bridges or causeways



Source: Mabey Compact 200™



Source: Flexifloat



Source: Wikipedia



Existing Level of Emergency Bridge Stock in Tasmania

- State Roads
 - 3 x 15m and 1 x 45 m Bailey bridges
 - Components are ageing and deteriorating
- Local Councils
 - Bailey components and other temporary structures
 - Numerous councils have made requests for bridging
- Local Industry
 - Timber short-span bridges, shipping container bases
 - 12-14m long concrete plank bridges
 - Steel bridges up to 18m spans suitable for highway loading



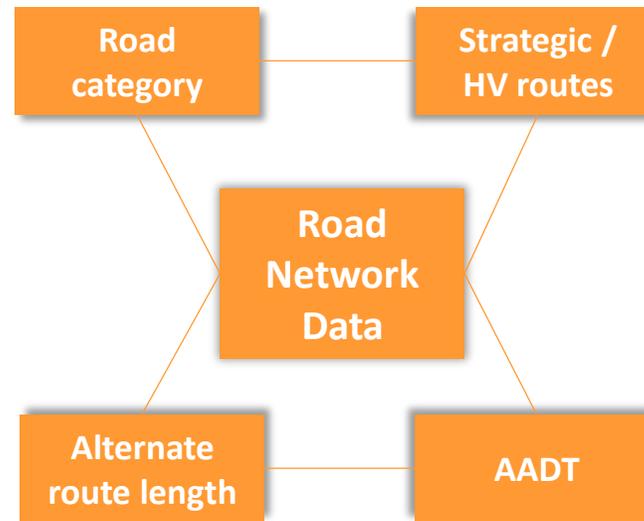
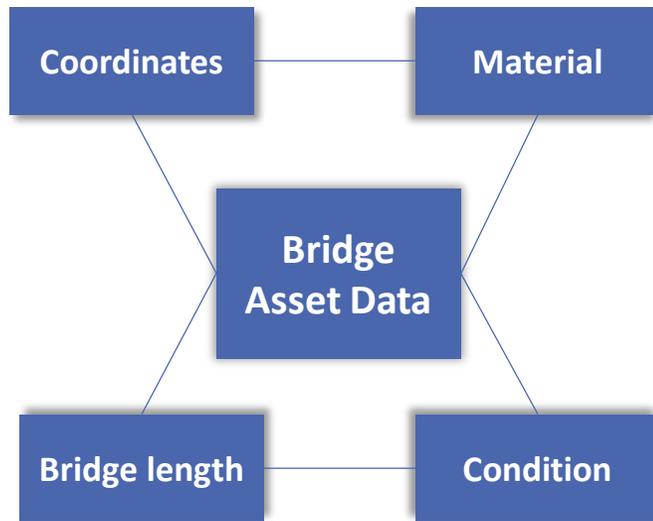
Source: Jacobs, 2017



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How Much Do We Need? Location Based Analytics

- Asset and road network information collated for over 3,000 bridges
- Rapid, large-scale assessment conducted in a GIS database



Source: Jacobs, 2017



Multi-Criteria Assessment (MCA)

Road Network Importance Score

Road Network Information	Score Range	Weighting (%)	Weighted Score Range
Alternate route length	1-7	25	25 – 175
Road category	1-7	30	30– 210
Strategic & heavy vehicle routes	1-7	15	15 – 105
AADT	1-7	30	30 – 210
TOTAL		100	100 - 700



Source: ListMap, 2019



Source: Google Images, 2019

Bridge Material and Condition Score

Bridge Asset Information	Score Range	Weighting (%)	Weighted Score Range
Material	1-5	10	10 – 50
Condition	1-5	90	90 – 450
TOTAL		100	100 – 500

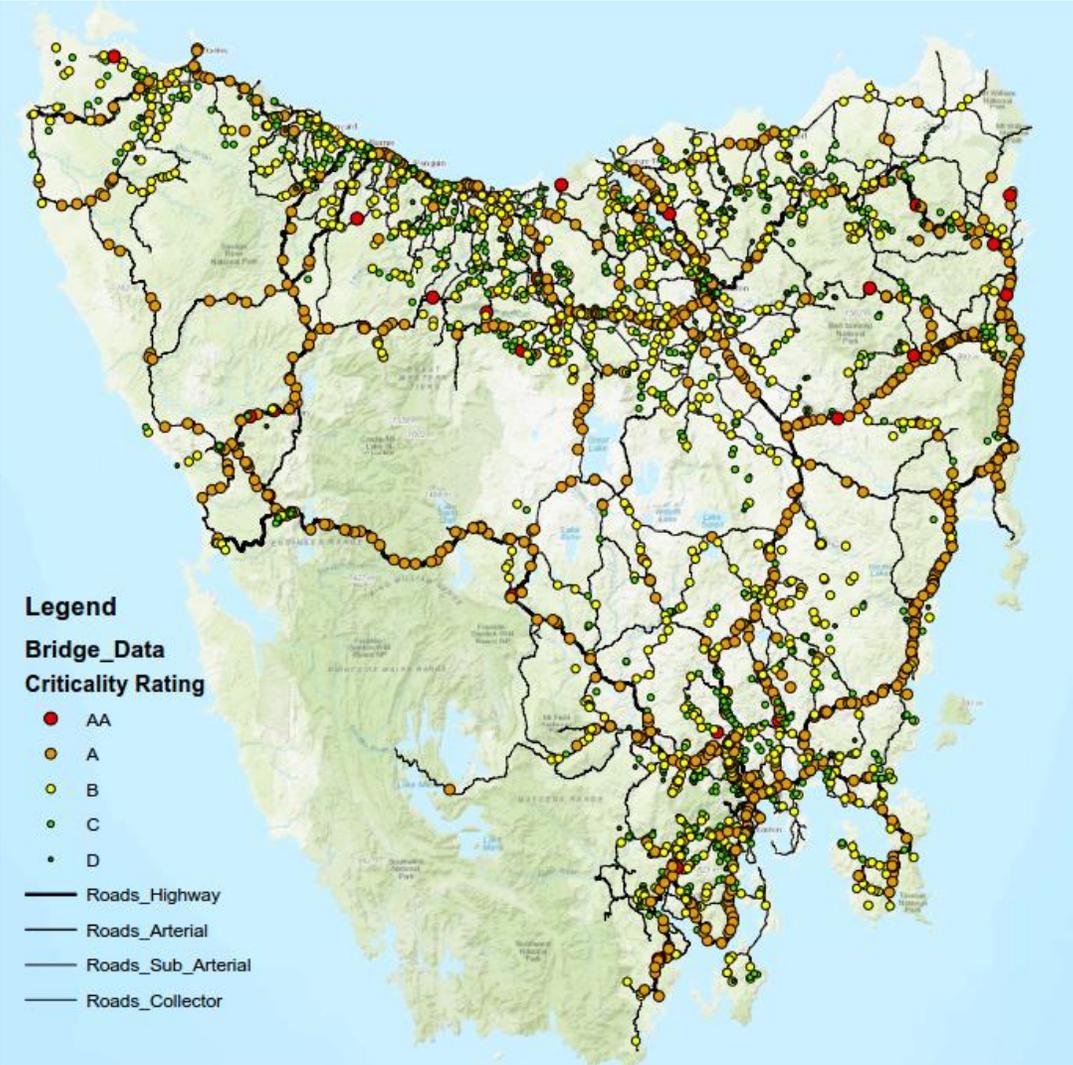


Critical Bridge Bandings

Network Importance Score

Material Condition Score

Bridge's
Criticality



Source: Jacobs, 2017



Failure Scenarios

- High criticality bridges were mapped against various emergency scenarios:
 - 1% AEP flood
 - 2016 flood levels
 - Inundation due to dam break
 - Bushfire

Critical Bridges Impacted in Widespread Emergency Scenarios

Parameter	1% AEP flood	June 2016 flood	Dam break	Fire
Number of critical bridges affected – AA Criticality Band	2	5	1	3
Combined length of critical bridges affected (m) – AA Criticality Band	93	115	62	77



Sensitivity and Verification

- Adjusted criticality bandings
- Comparison against June 2016 floods
- Stakeholder consultation
- RMS (NSW) emergency bridge stock

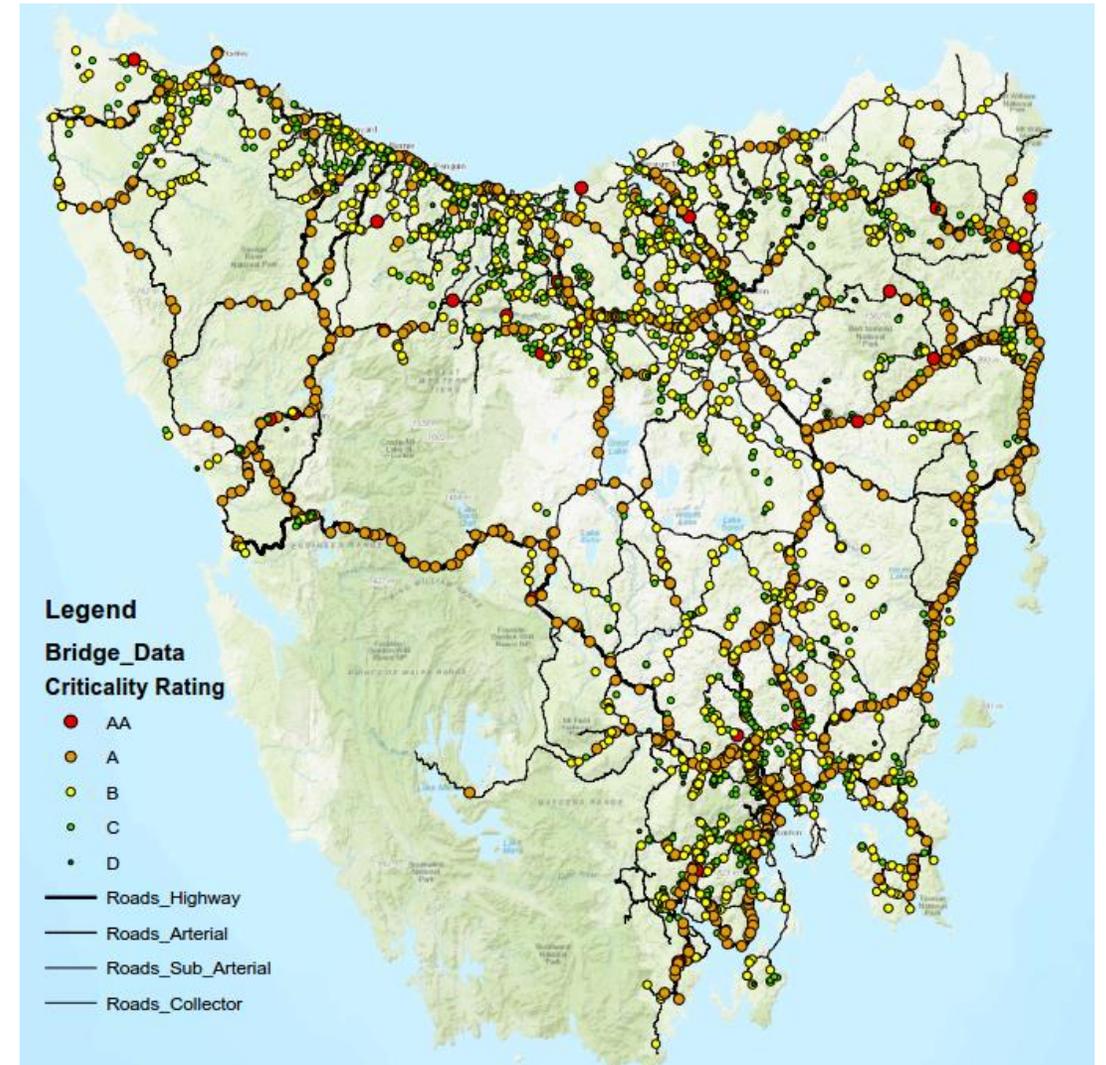


Source: RMS (NSW), 2019



Conclusions

- June 2016 flood levels - **115m of bridging**
- Current State Growth bridge stock - **90m**
- Contemporary panel bridging unlikely to be compatible
- Consider capacity of industry to fulfil needs



Source: Jacobs, 2017



Other Applications

- Location based analytics are shaping the future of emergency management
- Technologies are continually evolving



Fuel reduction programming



**Asset renewals and network
redundancy planning**



Flood mitigation design



Thanks for Listening!

...Questions?

I would like to acknowledge the following project contributors:

- Jacobs colleagues
- Department of State Growth
- DPIPWE
- RMS (NSW)
- Local bridging suppliers
- Local Councils

