Published on *Bushfire & Natural Hazards CRC* (https://www.bnhcrc.com.au)

Cyclone damage in Queensland, 2009

Key Topics:

- cyclone [2]
- engineering [3]
- mitigation [4]

Improving the resilience of existing housing to severe wind events [5]

This study identified vulnerable legacy house types across Australia and developed cost-effective retrofits for mitigation damage during windstorms. These evidence-based strategies will aid policy formation and decision making by Government and industry, and provide guidelines detailing various options and benefits to homeowners and the industry for retrofitting typical at-risk houses in Australia. The final report presents an overview of the research approach used for this project including the selection of house types, the development of the Vulnerability and Adaptation to Wind Simulation software and the Internet-based guidelines, Weather the Storm.

Project: detail Notabs

Research team

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Description

The primary objective of this study was to identify vulnerable legacy house types across Australia and develop cost-effective retrofits for mitigating damage during windstorms. These evidence-based strategies will (a) aid policy formulation and decision making by Government and industry, and (b) provide guidelines detailing various options and benefits to homeowners and the industry for retrofitting typical at-risk houses in Australia.

The final report presents an overview of the research approach used for this project including the selection of house types, the development of the VAWS software and the Internet-based guidelines. A case study is presented of the vulnerability and benefit cost assessment of one of the selected house types, with the complete set of results presented in the Appendices. These results show that tile roofed houses in cyclonic regions of Australia benefit the most from retrofitting for severe wind events. The benefit-cost ratios for these tile roof houses and other house types are expected to improve when accounting for intangible costs, which are currently not included in the analyses presented in this report. In addition, examples of the impacts and utilisation of this project including the Queensland Government Housing Resilience Program are also presented.

Read the final report here. [33]

Related News

22 APR 2021

New online – April 2021

MULTI-HAZARD, RESILIENCE

[34]

25 JAN 2021

New website to keep the roof over your head

CYCLONE, ENGINEERING

[35]

25 SEP 2020

New online - September 2020

EMERGENCY MANAGEMENT, FIRE

[36]

11 DEC 2019

Special edition Monographs share AFAC19 science

EMERGENCY MANAGEMENT, LAND MANAGEMENT

[37]

09 DEC 2019

Homes can be better prepared for cyclones. But first we must convince the owners

COMMUNICATION, CYCLONE

[38]

09 OCT 2019

New online - October 2019

EMERGENCY MANAGEMENT, ENGINEERING

[39]

08 OCT 2019

CRC backed program receives state award

CYCLONE, EMERGENCY MANAGEMENT

[40]

09 AUG 2019

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COINCIDENT EVENTS, FORECASTING

[41]

16 APR 2019

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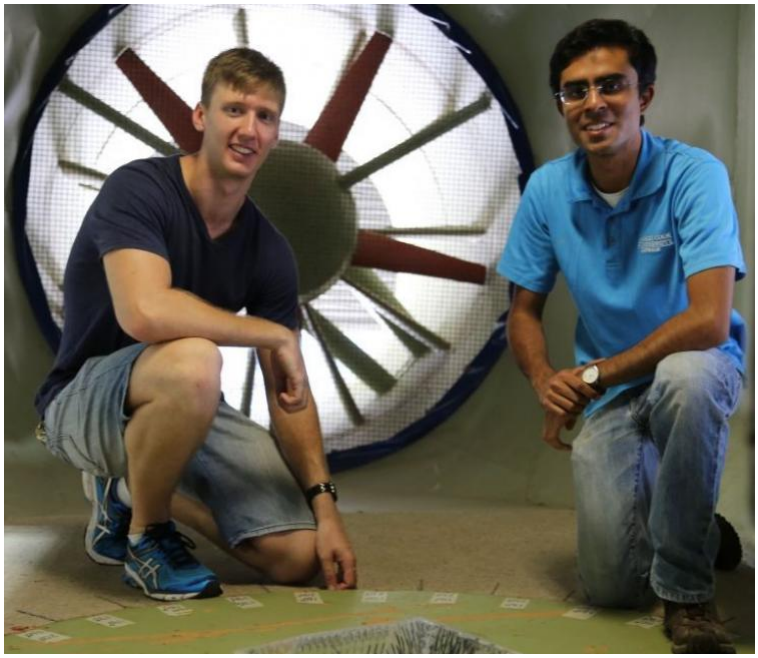
CYCLONE, EARTHQUAKE

[42]



11 JAN 2019

Student cyclone interest up north

CYCLONE, MITIGATION

[43]

18 DEC 2018

New online - December 2018

EMERGENCY MANAGEMENT, MODELLING

[44]

12 DEC 2018

Strength in the face of high winds

CYCLONE, ENGINEERING

[45]

07 DEC 2018

Preparing for the future focus of magazine

CYCLONE, EMERGENCY MANAGEMENT

[46]

06 DEC 2018

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CYCLONE, MITIGATION

[47]

18 SEP 2018

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[48]

23 AUG 2018

New grant for Queenslanders

CYCLONE, MITIGATION

[49]

20 JUL 2018

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CYCLONE, RESILIENCE

[50]

01 JUN 2018

Making a difference

FIRE, RISK MANAGEMENT

[51]

31 MAY 2018

Enhancing teamwork and research utilisation

COMMUNITIES, DECISION MAKING

[52]

18 DEC 2017

Strength in the face of high winds

CYCLONE, ENGINEERING

[53]

20 NOV 2017

Cyclone research briefings underway

COMMUNICATION, CYCLONE

[54]

17 NOV 2017

New online - November 2017

[55]

08 NOV 2017

Research featured in Journal

EMERGENCY MANAGEMENT, MULTI-HAZARD

[56]

19 OCT 2017

Harvey damage assessed by team

CYCLONE, ENGINEERING

[57]

20 SEP 2017

International team investigates Hurricane Irma

CYCLONE, ENGINEERING

[58]

31 AUG 2017

Science to show impact of Cyclone Debbie

CYCLONE, ENGINEERING

[59]

19 APR 2017

Science to show impact of Cyclone Debbie

CYCLONE, ENGINEERING

[60]

29 MAR 2017

Measuring Debbie

CYCLONE, ENGINEERING

[61]

07 DEC 2016

Researchers test tropical cyclone deployment strategies

CYCLONE, ENGINEERING

[62]

26 OCT 2016

Journal publishes important research

[63]

13 OCT 2016

New online - October 2016

[64]

16 AUG 2016

New online - August 2016

[65]

20 JUL 2016

Failures on re-roofed houses

CYCLONE, EXPOSURE

[66]

17 MAY 2016

Videos highlight research benefits

COASTAL, INDIGENOUS COMMUNITIES

[67]

25 JAN 2016

Earthquake and wind testing in Adelaide

CYCLONE, EARTHQUAKE

[68]

24 APR 2015

House Upgrades in the Wind

CYCLONE, INFRASTRUCTURE

[69]

24 APR 2015

CRC magazine details research

ENGINEERING, FIRE WEATHER

[70]

15 APR 2015

Cyclones provide important data

COASTAL, CYCLONE

[71]

11 DEC 2014

You can help wind research

CYCLONE, SEVERE WEATHER

[72]

Publications

Year	Type	Citation
2021	Report	Ginger, J. [6] *et al.* **Improving the resilience of existing housing to severe wind events - final project report** [33]. (Bushfire and Natural Hazards CRC, 2021). Google Scholar [73] BibTeX [74] EndN
2020	Report	Parackal, K. [15] *et al.* **Improving the resilience of existing housing to severe wind events: annual report 2019-2020** [76]. (Bushfire and Natural Hazards CRC, 2020). Google Scholar [77] BibTeX [7
2019	Book Chapter	Krupar, III, R. [80] & Smith, D. J. [81] *Hurricane Risk* **1,** 199-214 (Springer, 2019). DOI [82] Google Scholar [83] BibTeX [84] EndNote XML [85]
2019	Conference Paper	Parackal, K. [15] *et al.* **Modelling the vulnerability of a high-set house roof structure to windstorms using VAWS** [86]. *Bushfire and Natural Hazards CRC Research Day AFAC19* (2019). at <https:/
2019	Report	Ginger, J. [6] *et al.* **Improving the resilience of existing housing to severe wind events - annual report 2018-19** [91]. (Bushfire and Natural Hazards CRC, 2019). Google Scholar [92] BibTeX [93] E
2019	Report	Parackal, K. [15], Ginger, J. [6], Leblais, A. [95] & Henderson, D. [8] **Rainwater ingress through residential sliding doors** [96]. (Bushfire and Natural Hazards CRC, 2019). Google Scholar [97] BibTeX
2019	Report	Parackal, K. [15], Ginger, J. [6], Wehner, M. [11] & Henderson, D. [8] **Retrofitting of a high-set Queensland house for wind loading** [100]. (Bushfire & Natural Hazards CRC, 2019). Google Scholar [1
2019	Report	Henderson, D. [8], Smith, D. [13], Parackal, K. [15] & Ginger, J. [6] **Analysis of damage surveys of houses and preliminary input of VAWs** [104]. (Bushfire and Natural Hazards CRC, 2019). Google
2019	Report	Henderson, D. [8] *et al.* **Improving the resilience of existing housing to severe wind events in Australia Annual Report 2017-2018** [108]. (Bushfire and Natural Hazards CRC, 2019). Google Schola
2019	Report	Parackal, K. [15] *et al.* **Model for assessing the vulnerability of Australian housing to windstorms - VAWS** [112]. (Bushfire and Natural Hazards CRC, 2019). Google Scholar [113] BibTeX [114] En
2019	Report	Parackal, K. [15], Ginger, J. [6], Henderson, D. [8] & Wehner, M. [11] **Community benefits of roof upgrades** [116]. (Bushfire and Natural Hazards CRC, 2019). Google Scholar [117] BibTeX [118] Endl
2018	Conference Paper	Bates, J. [120] **Research proceedings from the 2018 Bushfire and Natural Hazards CRC and AFAC Conference** [121]. *Bushfire and Natural Hazards CRC & AFAC annual conference 2017* (Bushfir
2018	Conference Paper	Henderson, D. [8], Smith, D. [13] & Ginger, J. [6] **Large damage bills to buildings from cyclones can be reduced by small actions** [125]. *AFAC18* (Bushfire and Natural Hazards CRC, 2018). Google
2018	Journal Article	Stewart, M. [129], Ginger, J. [6], Henderson, D. [8] & Ryan, P. [130] **Fragility and climate impact assessment of contemporary housing roof sheeting failure due to extreme wind** [131]. *Engineeri*
2018	Journal Article	Parackal, K. [15], Ginger, J. [6] & Henderson, D. [8] **Wind load fluctuations on roof batten to rafter/truss connections** [136]. *Journal of Wind Engineering & Industrial Aerodynamics* **175,** (2018). DOI
2018	Journal Article	Jayasinghe, N. [141], Ginger, J. [6], Henderson, D. [8] & Walker, G. [142] **Distribution of wind loads in metal-clad roofing structures** [143]. *Journal of Structural Engineering* **144,** (2018). DOI [144] G
2018	Report	Leblais, A. [95] & Henderson, D. [8] **Simulated wind load strength testing of soffits** [148]. (Bushfire and Natural Hazards CRC, 2018). Google Scholar [149] BibTeX [150] EndNote XML [151]
2018	Report	Leblais, A. [95] & Henderson, D. [8] **Simulated wind load strength testing of entrance doors** [152]. (Bushfire and Natural Hazards CRC, 2018). Google Scholar [153] BibTeX [154] EndNote XML [155
2017	Journal Article	Smith, D. [13], Krupar, III, R. [80], Henderson, D. [8] & Mason, M. S. [156] **Analysis of rapid damage assessment data following severe windstorm events** [157]. *Australian Journal of Emergency M*
2017	Report	Kloetzke, T. [161] *et al.* **Severe wind hazard preliminary assessment: Tropical Cyclone Debbie, Whitsunday Coast, Queensland, Australia** [162]. (James Cook University, 2017). at <https://www.j
2017	Report	Boughton, G. N. [167] *et al.* **Tropical Cyclone Debbie: damage to buildings in the Whitsunday Region** [168]. *Technical report (James Cook University, Cyclone Testing Station)* (James Cook Univer
2017	Report	Henderson, D. [8] *et al.* **Improving the resilience of housing to severe wind events: annual project report 2016-17** [173]. (Bushfire and Natural Hazards CRC, 2017). Google Scholar [174] BibTeX [
2016	Conference Paper	Rumsewicz, M. [177] **Research proceedings from the 2016 Bushfire and Natural Hazards CRC and AFAC conference** [178]. *Bushfire and Natural Hazards CRC & AFAC annual conference 2016* (E
2016	Conference Paper	Harwood, J. [182], Smith, D. J. [81] & Henderson, D. [8] **Building community cyclone resilience through academic and community partnership** [183]. *AFAC16* (Bushfire and Natural Hazards CRC
2016	Journal Article	Smith, D. [13], McShane, C. [187], Swinbourne, A. [188] & Henderson, D. [8] **Towards effective mitigation strategies for severe wind events** [189]. *The Australian Journal of Emergency Managemer*
2016	Journal Article	Satheeskumar, N. [193], Henderson, D. [8], Ginger, J. [6] & Wang, C. H. [194] **Wind uplift strength capacity variation in roof-to-wall connections of timber-framed houses** [195]. *Journal of Architec*
2016	Journal Article	Leitch, C. J. [200], Ginger, J. [6] & Holmes, J. D. [201] **Wind loads on solar panels mounted parallel to pitched roofs, and acting on the underlying roof** [202]. *Wind and Structures* **22,** 307-328 (20
2016	Journal Article	Smith, D. [13], Masters, F. J. [207] & Chowdhury, A. G. [208] **Investigating a wind tunnel method for determining wind-induced loads on roofing tiles** [209]. *Journal of Wind Engineering and Indus*
2016	Report	Smith, D. [13] *et al.* **Improving the resilience of existing housing to severe wind events: Annual project report 2015-2016** [214]. (Bushfire and Natural Hazards CRC, 2016). Google Scholar [215] E
2015	Conference Paper	Henderson, D. [8] & Ginger, J. [6] **Improving the Resilience of Existing Housing to Severe Wind Events Conference Paper 2014** [218]. *Bushfire and Natural Hazards CRC and AFAC Wellington Co*
2015	Conference Paper	Rumsewicz, M. [177] **Research proceedings from the 2015 Bushfire and Natural Hazards CRC & AFAC conference** [222]. *Bushfire and Natural Hazards CRC & AFAC annual conference 2015* (Bus
2015	Journal Article	Smith, D. [13], Henderson, D. [8] & Terza, L. M. [226] **Modelling cyclone loss mitigation using claims analysis** [227]. (2015). Google Scholar [228] BibTeX [229] EndNote XML [230]
2015	Journal Article	Smith, D. [13], Roueche, D. [231], Thompson, A. P. [232] & Prevatt, D. O. [233] **A vulnerability assessment tool for residential structures and extreme wind events** [234]. (2015). Google Scholar [2
2015	Report	Henderson, D. [8] **Improving the Resilience of Existing Housing to Severe Wind Events Annual Report 2014** [238]. (2015). Google Scholar [239] BibTeX [240] EndNote XML [241]
2015	Report	Smith, D. [13], Henderson, D. [8], Ginger, J. [6] & Wehner, M. [11] **Improving the resilience of existing housing to severe wind events: Annual project report 2014-2015** [242]. (Bushfire and Natura
2014	Journal Article	Smith, D. [13], Masters, F. J. [207] & Gurley, K. R. [246] **An historical perspective on the wind resistance of clay and concrete roofing tiles** [247]. *RCI Interface* **32,** 22-35 (2014). Google Scholar [2

Presentations & Resources

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20 Mar 2014	Resilience and Mitigation through Hardening the Built Environment [253]	16.21 MB	[254] (16.21 MB), cyclone [2], earthquake [256]
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19 Jun 2015	TC Nathan Rapid Assessment Report [266]	2.42 MB	[267] (2.42 MB), engineering [3]
19 Jun 2015	Tropical Cyclone Olwyn Rapid Damage Assessment [268]	790.15 KB	[269] (790.15 KB), engineering [3]
04 May 2016	Hardening buildings and infrastructure - cluster overview [270]	0 bytes	[271] (0 bytes), engineering [3], infrastructure [272], multi-hazard [273]
30 Aug 2016	Cyclone Resilience through academic and industry partnership - Daniel Smith [274]	2.76 MB	[275] (2.76 MB), engineering [3], severe weather [263]
01 Sep 2016	Are our homes and buildings failing us? - David Henderson [276]	8.26 MB	[277] (8.26 MB), engineering [3], severe weather [263]
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30 Jan 2017	Strengthening infrastructure for natural hazard impacts [281]	358.94 KB	[282] (358.94 KB), earthquake [256], engineering [3], mitigation [4]
27 Apr 2017	Builders - replacing roofing on houses [283]	0 bytes	[284] (0 bytes), engineering [3], mitigation [4]
27 Apr 2017	Owners - replacing roofs on houses [285]	0 bytes	[286] (0 bytes), engineering [3], mitigation [4]
27 Apr 2017	Builders - re-roofing after storm damage [287]	0 bytes	[288] (0 bytes), engineering [3], mitigation [4]
27 Apr 2017	Owners - re-roofing after storm damage [289]	0 bytes	[290] (0 bytes), engineering [3], mitigation [4]
07 Jul 2017	Towards a safer built environment [291]	8.24 MB	[292] (8.24 MB), engineering [3], infrastructure [272], multi-hazard [273]
31 Aug 2017	Fire Australia Issue Three 2017 [293]	5.22 MB	[294] (5.22 MB), [295], prescribed burning [296], severe weather [263]
07 Sep 2017	Analysis of rapid damage assessment data following severe windstorm events [297]	3.31 MB	[298] (3.31 MB), engineering [3], severe weather [263]
31 Oct 2017	Built environment cluster [299]	713.22 KB	[300] (713.22 KB), mitigation [4], multi-hazard [273]
01 Jun 2018	Fire Australia Issue Two 2018 [301]	6.73 MB	[302] (6.73 MB), [303], decision making [304], emergency management [30
19 Sep 2018	Large damage bills (to buildings) from cyclones can be reduced by small actions [306]	6.95 MB	[307] (6.95 MB), resilience [280]
23 Nov 2018	Improving the resilience of existing housing to severe wind events [308]	3.32 MB	[309] (3.32 MB), modelling [262], resilience [280]
05 Dec 2018	Fire Australia Issue Four 2018 [310]	4.99 MB	[311] (4.99 MB)
30 Jul 2019	Improving the Resilience of Existing Housing to Severe Wind Events [312]	3.37 MB	[313] (3.37 MB), modelling [262], resilience [280]
27 Aug 2019	Improving the Resilience of Existing Housing to Severe Wind Events [314]	3.51 MB	[315] (3.51 MB), severe weather [263]
25 Nov 2020	Strength in the face of high winds [316]		cyclone [2], engineering [3], mitigation [4]
17 May 2021	Fire Australia Issue Two 2021 [317]	11.74 MB	[318] (11.74 MB), emergency management [305], Northern Australia [320

Posters

[321]

Improving the resilience of existing housing to severe wind events

[321]

Typically, older houses do not offer the same level of performance and protection during windstorms as houses...

[322]

Improving the Resilience of Existing Housing to Severe Wind Events

[322]

MITIGATION [4], RESILIENCE [280]

Many of us live in homes with vulnerabilities that contribute to community wind risk. This project aims to...

[323]

Improving the resilience of existing housing to severe wind events

[323]

INFRASTRUCTURE [272], RESILIENCE [280]

Many of us live in homes with vulnerabilities that contribute to community wind risk.

12 AUG 2016

[324]

Internal pressure fluctuations in industrial buildings

[324]

INFRASTRUCTURE [272], RESILIENCE [280]

Internal pressures can contribute to a large portion of the net wind load on a building.

29 JUN 2017

[325]

Improving the resilience of existing housing to severe wind events

[325]

CYCLONE [2], ENGINEERING [3]

This project aims to investigate windstorm risk mitigation by: (a) developing vulnerability models for...

19 SEP 2016

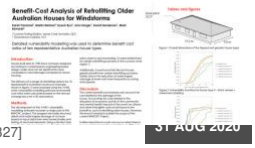
[326]

Improving the resilience of existing housing to severe wind events

[326]

CYCLONE [2], ENGINEERING [3]

This project aims to investigate and reduce damage from windstorms by developing vulnerability models for...



31 AUG 2020

[327]

Benefit-Cost Analysis of Retrofitting Older Australian Houses for Windstorms

[327]

RESILIENCE [280], SEVERE WEATHER [263]

Key findings: Certain house types can benefit from retrofitting for severe wind events

Linked Projects

Cost-effective mitigation strategy for building related earthquake risk [328]

BUILT ENVIRONMENT [329]

Prof Michael Griffith
University of Adelaide [330]

[330]

Cost-effective mitigation strategy for flood prone buildings [331]

BUILT ENVIRONMENT [329]

Dr Ken Dale
Geoscience Australia [10]

[10]

Enhancing resilience of critical road infrastructure [332]

BUILT ENVIRONMENT [329]

Prof Sujeeva Setunge
RMIT University [333]

[333]

Natural hazard exposure information modelling framework [334]

BUILT ENVIRONMENT [329]

Dr Krishna Nadimpalli
Geoscience Australia [10]

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