Assessment and Resilient Design of Buildings for Bushfires

Sahani Hendawitharana, Anthony Ariyanayagam, Mahen Mahendran, Felipe Gonzalez and Dmitry Bratanov

Queensland University of Technology, Brisbane, Australia.
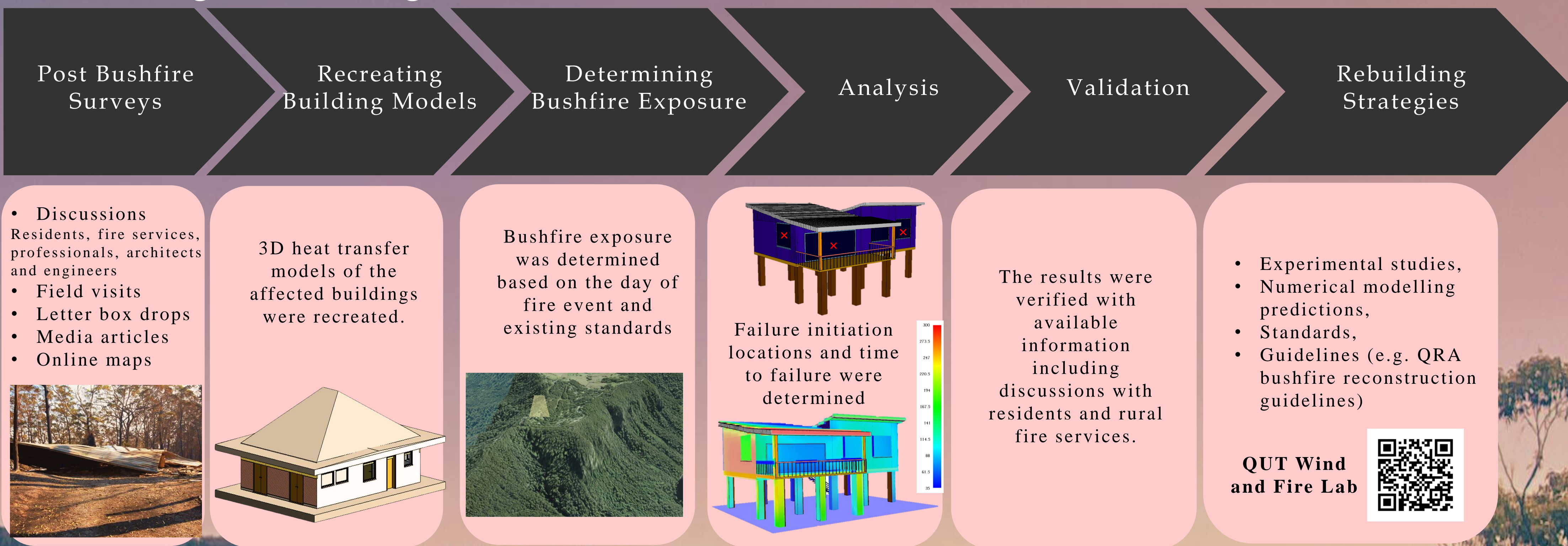
Collaborative Effort by:

Aim:

To improve understanding of building performance during bushfires by utilizing advanced technologies and computational modelling and provide evidence-based solutions to improve resilience of buildings for future fires

Challenges:

How existing buildings perform in bushfires?

How to enhance resilience of buildings to bushfires?

Our Approach

For Buildings Lost During Bushfires

| Post Bushfire Surveys | Recreating Building Models | Determining Bushfire Exposure | Analysis | Validation | Rebuilding Strategies |

- **Discussions**
  Residents, fire services, professionals, architects and engineers
- **Field visits**
- **Letter box drops**
- **Media articles**
- **Online maps**

3D heat transfer models of the affected buildings were recreated.

Bushfire exposure was determined based on the day of fire event and existing standards

Failure initiation locations and time to failure were determined

The results were verified with available information including discussions with residents and rural fire services.

- Experimental studies,
- Numerical modelling predictions,
- Standards,
- Guidelines (e.g. QRA bushfire reconstruction guidelines)

QUT Wind and Fire Lab

For Existing Buildings

| Pre-Bushfire Surveys | Recreating Building Models | Determining Bushfire Exposure | Fire Tests | Analysis | Retrofitting Strategies |

Captured data of buildings and surroundings using state-of-the-art technologies

Near-accurate 3D heat transfer models of the buildings were created

Potential bushfire exposure conditions were determined.

Fire tests were used to validate the outcomes

Computational analysis predicted the areas to prioritize retrofitting

temp (C)
500
452
404
356
260
212
164
116
68
20

- Experimental studies,
- Numerical modelling predictions,
- Standards,
- Guidelines (e.g. QRA bushfire reconstruction guidelines)

QUT Wind and Fire Lab

Sharing the Outcomes

- Academic Conferences
- Industry Conferences
- Local Disaster Management Groups
- Community Events and Discussions

| Local Media | AFAC/ IFE 2023 | ASEC 2024 | Community Awareness Event in Tamborine |

Next Steps: Continuous improvements and collaborations to improve the resilience of buildings against bushfires