LIDAR-Based CFD Models For Building Safety In Bushfires

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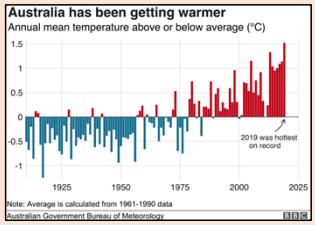
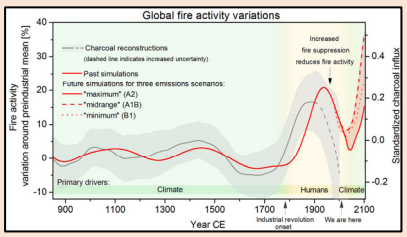
Bushfire Safety of Existing Buildings

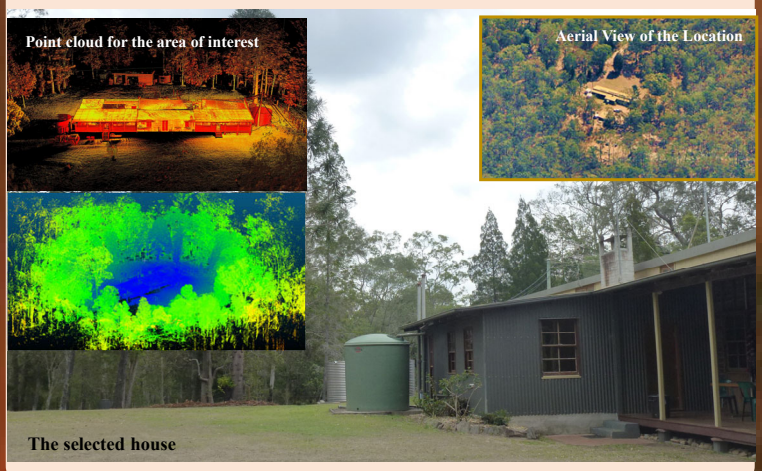


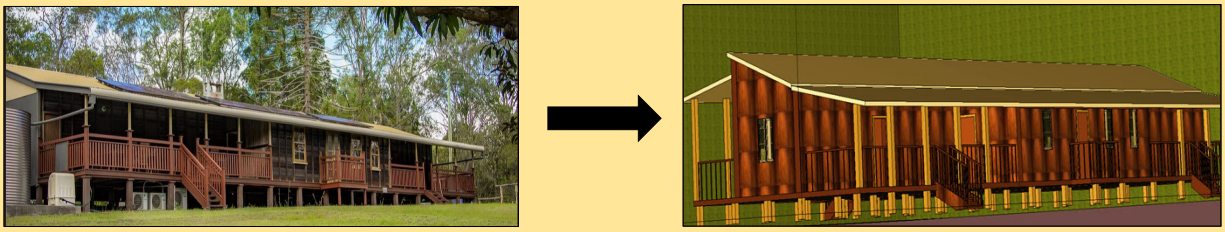
Australian Annual Mean Temperatures
(bom.gov.au)



Global fire activity in the past and future predictions
(NASA.gov)

Use of LiDAR Technology in Bushfire Applications

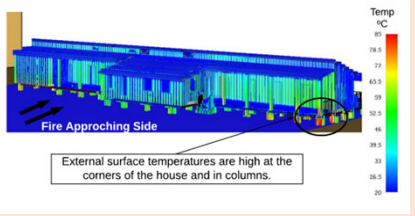




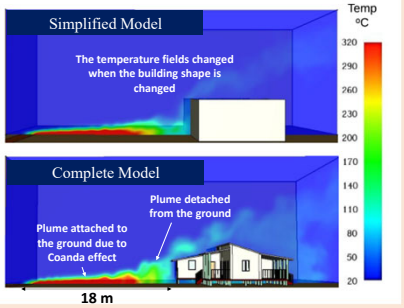
(Hendawitharana et al. 2021)

Case Study using a Real Building

Surface temperatures

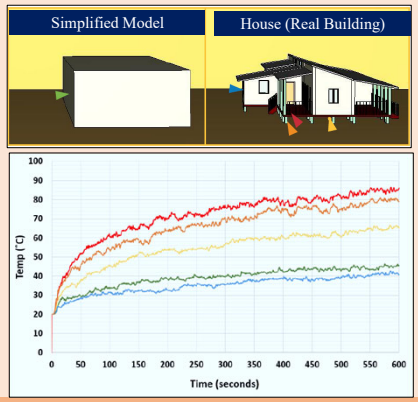


Air temperatures

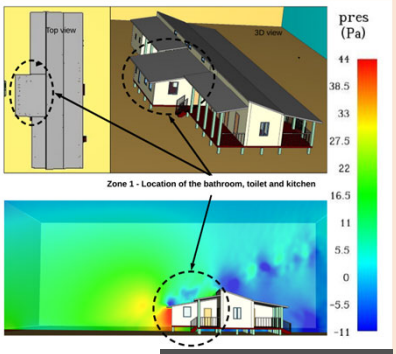


(Hendawitharana et al. 2021)

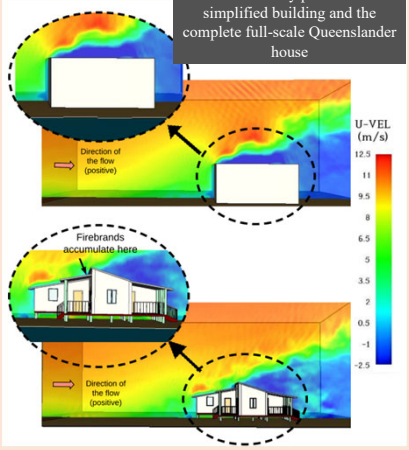
Surface temperatures - Simplified model and a House



Pressure distributions



Wind velocity profiles for simplified building and the complete full-scale Queenslander house



(Hendawitharana et al. 2021)

- **The point clouds obtained from the LiDAR survey were used to develop heat transfer models.**
- **Fire Dynamic Simulator (FDS) and Pyrosim were used to conduct the heat transfer analysis.**
- **The computational domain was 45 m × 60 m × 17 m**
- **Bushfire attack was simulated as a 2 m wide 2D burning strip with a heat release rate of 1000 kW/m² located 18 m from the house.**

- **The stumps and the deck on the fire side showed the highest temperatures and therefore, are highly vulnerable.**
- **High wind velocities and pressures were observed under the floor, while the hot air moved to the non-fire exposed side.**
- **The burning embers/ firebrands carried by the flow are likely to accumulate on the roof - next to the ridge**

The proposed method can develop realistic building models of existing buildings and identify and analyse their risks and vulnerabilities when exposed to bushfires.

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For more details: Hendawitharana, S., Ariyanayagam, A., Mahendran, M. and Gonzalez, F., 2021. LiDAR-based Computational Fluid Dynamics heat transfer models for bushfire conditions. *International Journal of Disaster Risk Reduction*, 66, p.102587.