Geoneon

MAPPING CLIMATE RISKS

Bushfire Exposure Index

Greater Hobart 2022-2023

December 2023

Australian Government

https://hobart.geoneon.com/

Geoneon

GLENORCHY CITY COUNCIL

City of HOBART

Kingborough

About the Project

The Bushfire Exposure Index for the Greater Hobart 2022-2023 constitutes an element of Geoneon's comprehensive "Anticipate and Monitor the Impact of Bushfires in Greater Hobart" project. This project, which commenced in May 2022 and is set to end in May 2025, is part of the broader "Preparing Australian Communities – Local Stream" initiative, funded by the National Emergency Management Agency. It focuses within the jurisdictions of Glenorchy, Hobart, and Kingborough—areas that are increasingly vulnerable to the augmented risks associated with extended fire seasons and a significant uptick in extreme fire danger days, projected at 40%.

Through sophisticated semi-automated tools and a dedicated web platform, the project will deliver granular bushfire data, enhancing bushfire risk mitigation. This initiative not only fortifies the preparedness of communities and local governments but also gives residents critical insights, fostering a culture of resilience and proactive response amidst the escalating threats of natural disasters.

About Geoneon

Geoneon is an innovative technology firm, leveraging AI to transform complex geospatial data into actionable climate risk insights for built and natural asset managers from both private and public organisations. Our unique solutions bridge the gap between environmental data and reporting, aiding in comprehensive and accurate climate risk disclosures.

INTRODUCTION

Anticipating and Adapting to Escalating Bushfire Risks

Over the next thirty years, Tasmania is projected to confront an escalation in bushfire risk, a critical concern linked to the broader narrative of global climate change. Tasmania is bracing for increased bushfire threats, with prolonged fire seasons and an anticipated 40% surge in extreme fire danger days.

The impacts of this environmental shift are already making their presence known across the island, manifesting in both physical and economic repercussions. Local governments and communities need precise geospatial information for effective bushfire planning.

The National Emergency Management Agency highlights the urgent necessity to act against the increasing effects of natural hazards as a result of climate change. The Agency notes:

"Through the Preparing Australian Communities Program - Local stream, we are actively enhancing communities' ability to mitigate, avoid, withstand, and recover from natural hazards like bushfires, floods, and tropical cyclones. This is achieved through a comprehensive approach encompassing planning, awareness and capacity building, and the delivery of resilient infrastructure, thereby fortifying the social, economic, built, and natural environments against the imminent challenges posed by these hazards."

In the wake of profound global climatic shifts, the United Nations Intergovernmental Panel on Climate Change (IPCC) unveiled its Sixth Assessment Report (AR6) in August 2021. The report delivers a stark, unambiguous message:

1. **Human influence has undeniably contributed to the warming of the atmosphere, oceans, and land.**
2. **This anthropogenic climate change is influencing numerous weather and climate extremes, including those related to bushfire risks.**
3. **The pace and intensity of these changes are unfolding more rapidly and severely than past projections indicated.**

The Insurance Council of Australia (ICA) has emphasized the need for early bushfire preparation so property owners and tenants can reduce risk and safeguard their homes and property. They stated:

"As summer approaches, the Insurance Council of Australia is emphasising the need for early bushfire preparation so property owners and tenants can reduce risk and safeguard their homes and property. Following three consecutive years of La Niña the Bureau of Meteorology has formally declared an El Niño event, coinciding with severe weather warnings and alerts for large parts of Australia's southeast. An El Niño event will increase the chances of record-high temperatures and extreme weather patterns over the next 12 months, particularly in eastern Australia. The impact of El Niño typically leads to more severe heatwaves, heightened bushfire risks, and worsening drought conditions as last experienced in the lead up to the catastrophic 2019-20 Black Summer bushfires."

ABOUT THE INDEX

Enhancing Bushfire Mitigation in Greater Hobart

The results presented in this report have been extracted for the Greater Hobart Bushfire Exposure Index.

The Bushfire Exposure Index is a mitigation tool that combines advanced deep-learning algorithms, high-resolution mapping, and multifaceted data to present a picture of bushfire exposure at a granular level. It offers a measure of the potential exposure of residential buildings and communities to bushfires.

With the availability of precise geospatial information presented by the Bushfire Exposure Index, local governments can prioritise safety measures more effectively and optimise resource allocation for mitigative actions. It allows authorities to develop targeted strategies to safeguard areas where people and assets are most at risk.

Beyond aiding government agencies, the Bushfire Exposure Index also serves as a public resource, enabling individuals and communities to understand their exposure levels to bushfires.

The benefits of the Bushfire Exposure Index include:

- **Strengthened Mitigation Strategies**: Improve hazard readiness by enhancing mitigation plans, reducing potential impacts, and optimising emergency responsiveness.
- **Community Engagement & Communication**: Promote risk awareness and collective action at community levels to ensure consistent and informed communication and engagement.
- **Sustainable Community Recovery**: Inform and guide communities towards long-term recovery strategies, focusing on resilience and sustainable rebuilding.
- **New Resident Education**: Provide essential education to new homeowners and renters about risks and preventive measures, promoting informed living choices.
- **Resource Allocation & Prioritisation**: Optimise the deployment of resources by prioritising needs, ensuring efficiency and efficacy in addressing varied risks.
- **Refined Risk Assessments**: Identify the need for more detailed and precise risk assessments, enhancing accuracy and reliability in hazard evaluations.

METHODOLOGY

Developing the Bushfire Exposure Index

In this section, we break down the processes involved in constructing the Bushfire Exposure Index. This includes the synthesis of the Bushfire Hazard Severity Index and the resultant Bushfire Exposure Index.

Bushfire Hazard Severity Index

This index is formulated by integrating fuel models, which are generated from ultra-high-resolution satellite data processed through Artificial Intelligence, with topographical data and post-processing steps.

In the context of our Hobart Bushfire Exposure Index, "Bushfire Hazard Severity" describes the potential intensity and behaviour of a bushfire in a specific location, given the local conditions. It is a measure that considers several factors to determine how severe a bushfire might become if it were to ignite in a particular area.

Here is what contributes to it:

- **Vegetation (Fuel) Type**: Different plants burn at different intensities. For instance, fires in grasslands might produce shorter flames than dense forests. Fires in forests, especially those with a dense understory or ladder fuels, can produce taller flames, more radiant heat, and a higher volume of ember attack.
- **Vegetation Density**: The density refers to how much vegetation is packed into a specific area. Denser vegetation can lead to more intense fires.
- **Topography (Slope)**: Fires tend to spread faster uphill because the flames can pre-heat the vegetation above them. Steeper slopes can, therefore, result in quicker and more intense fires.

Bushfire Exposure Index

The exposure index is developed by mapping the footprints of buildings from ultra-high-resolution satellite data, leveraging artificial intelligence. Each building is assigned an exposure score derived from its intersection with the hazard severity index, using the highest value from the intersecting index. The scores are then represented per parcel from the cadastre layers, utilising Tasmanian geospatial datasets to delineate the results, focusing exclusively on parcels with residential buildings.

STEP-BY-STEP

Geoneon's Bushfire Hazard Severity Index

Step 1: Vegetation Classification

- We utilise advanced deep-learning algorithms and high-resolution satellite data to create a detailed 50cm resolution vegetation map. This map effectively categorises vegetation into two primary types: high and low, each assigned a weight based on potential fire hazard.
- **Purpose**: Different vegetation types burn differently. Classifying vegetation into high and low categories helps predict the intensity of a potential fire in an area. Denser, high-category vegetation often leads to more intense fires.

Step 2: Size Consideration

- To focus on significant fire potential areas, we exclude smaller vegetation patches that are incapable of sustaining a 100-metre-long bushfire front.
- **Purpose**: Smaller patches of vegetation typically do not sustain large bushfires. By focusing on larger areas, we concentrate on regions that could potentially support a significant fire front, thus prioritising areas with higher fire propagation potential.

Step 3: Vegetation Density Measurement

- Our approach involves calculating dense vegetation within a 100-metre radius around each point on the map, based on the weighted vegetation classification.
- **Purpose**: The density of vegetation directly impacts fire intensity. Dense vegetation areas can lead to hotter and more severe fires. Measuring this density within a set radius provides insight into potential fire severity in that area.

Step 4: Slope Analysis

- Recognising the critical influence of terrain on fire behaviour, we incorporate an elevation model to assess land slope. Our slope factor calculations are grounded in the Australian BAL standards (AS 3959:2018), specifically using the formula: Slope factor = exp(0.069*Slope), with a cap on slopes equal to or exceeding 15 degrees.
- **Purpose**: Terrain affects how fires spread. Fires on slopes can spread rapidly as heat rises, pre-heating vegetation uphill. By analysing the slope, we can anticipate the preferential direction of fire spread, which is key for fire management strategies.

Step 5: Index Classification

- The results are categorised into 10 distinct classes, representing varying levels of hazard severity. These classes are determined by dividing the range of potential hazard severity—from minimal to maximum—into percentage intervals.
- **Purpose**: This step involves categorising the risk into classes, providing a clear and actionable risk assessment. It helps in understanding the range of fire behaviours expected across different areas, from minimal to extremely high hazard, facilitating classification and communication of the results.

RESULTS

Quantifying the Greater Hobart Bushfire Exposure

Overall, in Glenorchy, Hobart and Kingborough, Geoneon estimates 1,191 dwellings are subject to Moderately to Extremely High Bushire Exposure (Table 1).

***Table 1**: Number of dwellings exposed to bushfire (Moderately High to Extremely High) in Glenorchy, Hobart and Kingborough.*

Bushfire Exposure Index	Number of Dwellings
Extremely High	577
Very High	389
Relatively High	202
Moderately High	23
Total	**1,191**

Suburbs most exposed around the Greater Hobart

Geoneon has compiled a comprehensive list, categorising suburbs by their dwelling exposure to bushfire. This list is organised by Local Government Area (LGA) and includes the count of dwellings within each suburb. Our analysis focuses on evaluating the number of residences facing a 'moderately high' to 'extremely high' level of bushfire exposure in each council area.

Our analysis at the Local Government Area (LGA) level indicates that Kingborough has the highest number of properties notably exposed to bushfires. In contrast, the level of exposure in Hobart is less than half of Kingborough's, and Glenorchy's risk is under 10% when compared to Kingborough (Figure 1).

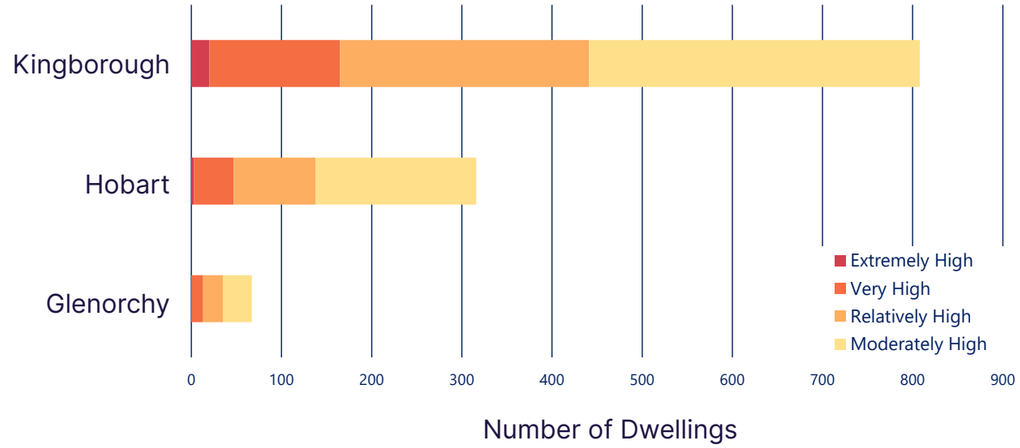


***Figure 1**: Number of dwellings exposed to bushfire (Moderately High to Extremely High) in Glenorchy, Hobart and Kingborough.*

In quantifying the bushfire exposure of dwellings, classified from 'Moderately High' to 'Extremely High', we have identified the top 10 suburbs within Glenorchy, Hobart, and Kingborough, based on the highest number of dwellings exposed. Table 2 presented below details the estimated count of residences exposed to bushfire risk in each of these suburbs.

***Table 2**: The ten suburbs with the highest estimated count of residential buildings subject to 'Moderately High' to 'Extremely High' exposure in Geoneon's Bushfire Exposure Index.*

Suburb	LGA	Number of Dwellings
Fern Tree	Hobart	154
Margate	Kingborough	125
Kingston	Kingborough	113
Kettering	Kingborough	74
South Hobart	Hobart	71
Oyster Cove	Kingborough	61
Collinsvale	Glenorchy	41
Taroona	Kingborough	38
Mount Nelson	Hobart	38
Bonnet Hill	Kingborough	32

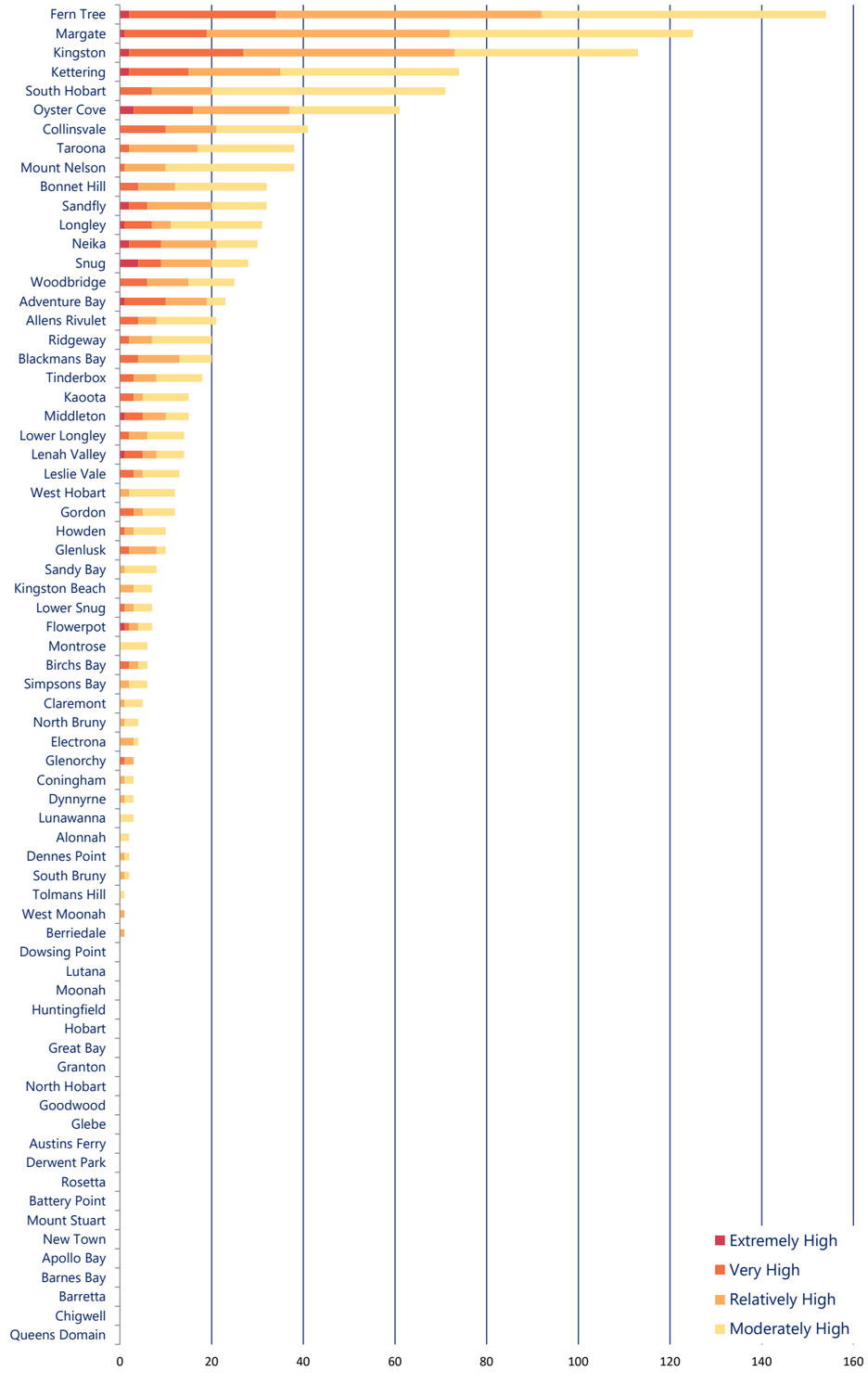
***Table 3**: The five suburbs per LGA with the highest estimated count of residential buildings subject to 'Moderately High' to 'Extremely High' exposure in Geoneon's Bushfire Exposure Index. The table shows the 10 index classes from 1 (Minimum) to 10 (Extremely High)*

Suburb	LGA	1	2	3	4	5	6	7	8	9	10
Collinsvale	Glenorchy	32	44	53	38	27	25	20	11	10	0
Glenlusk	Glenorchy	11	16	19	6	8	10	2	6	2	0
Montrose	Glenorchy	913	84	43	34	44	10	6	0	0	0
Claremont	Glenorchy	3,225	251	135	71	35	5	4	1	0	0
Glenorchy	Glenorchy	5,212	190	78	32	11	5	0	2	1	0
Fern Tree	Hobart	0	0	13	28	41	78	62	58	32	2
South Hobart	Hobart	1,305	447	323	249	188	113	51	13	7	0
Mount Nelson	Hobart	414	366	210	119	62	57	28	9	1	0
Ridgeway	Hobart	0	12	7	16	10	13	13	5	2	0
Lenah Valley	Hobart	2,302	421	145	70	39	22	6	3	4	1
Margate	Kingborough	956	193	132	100	66	55	53	53	18	1
Kingston	Kingborough	4,209	534	303	134	89	53	40	46	25	2
Kettering	Kingborough	57	71	59	46	45	45	39	20	13	2
Oyster Cove	Kingborough	1	3	9	28	22	18	24	21	13	3
Taroona	Kingborough	567	325	173	101	79	31	21	15	2	0

Many of the high-exposure suburbs are typically located in semi-rural or sub-urban areas where residential developments meet natural landscapes. This interface, often referred to as the Wildland-Urban Interface (WUI), is particularly vulnerable to bushfires. In these areas, houses are frequently interspersed with or bordering forested or bushland areas, leading to a higher exposure due to the proximity to natural fuel sources.

Nestled within Wellington Park, the suburb of Fern Tree is in close proximity to dense natural vegetation Figure 3 (top panel). This geographical setting, bordering extensive reserves and conservation areas, distinctly positions Fern Tree in a high bushfire exposure zone. The Bushfire Exposure Index, illustrated in Figure 3 (bottom panel), further confirms this, indicating a significantly elevated exposure level. The suburb's integration with the natural park environment not only highlights its unique appeal but also underscores the critical need for targeted bushfire risk management strategies.

***Figure 2 (right)**: Ranking of all suburbs from Glenorchy, Hobart, and Kingborough LGAs based on highest bushfire exposure of residential buildings, Index 7 to 10 (Moderately High to Extremely High).*



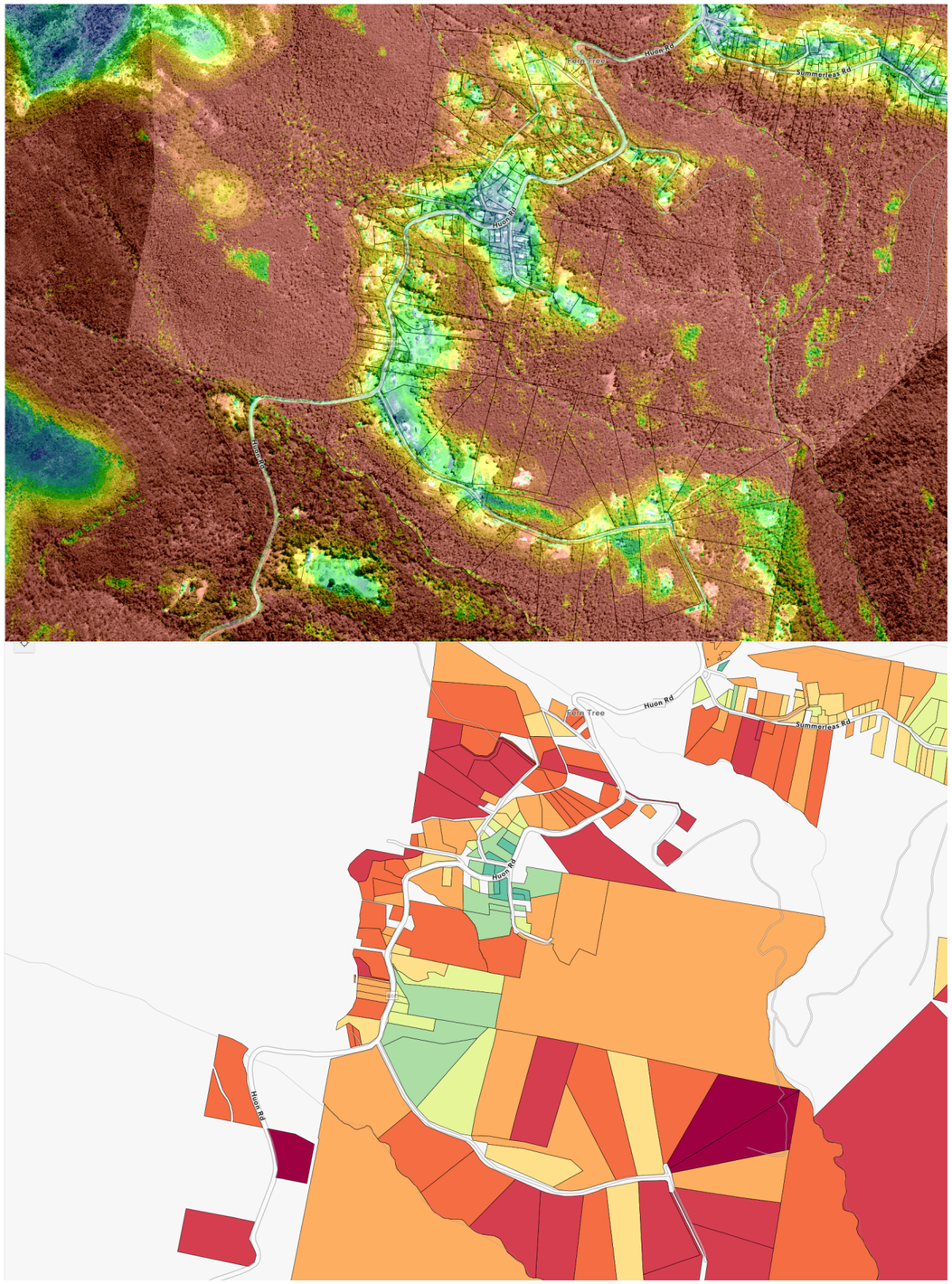


***Figure 3**: Like other suburbs in the Greater Hobart, Fern Tree is located in a Wildland-Urban Interface (WUI). The top panel illustrates the Bushfire Hazard Severity Index, depicting the close proximity of residential properties to dense vegetation within Fern Tree. On the same extent, the bottom panel presents the Bushfire Exposure Index, highlighting the heightened bushfire exposure in the area.*

CONCLUSION

Building Resilient Communities

The urgency of identifying and addressing bushfire risk in Tasmania has reached a critical point, as underscored by the latest findings of the IPCC report released in August 2021. With the projections of prolonged fire seasons and a 40% increase in extreme fire danger days, the risks associated with bushfires are escalating significantly.

Bushfire risk in Tasmania, particularly in high-exposure areas like Glenorchy, Hobart, and Kingborough, poses a growing concern. These regions, renowned for their scenic beauty and vibrant communities, have experienced significant population growth and development in recent years. With this growth, the need to comprehend and mitigate bushfire risks is more pressing than ever.

Moreover, the escalating bushfire risk is exerting pressure on insurance rates. Property owners in these areas are confronted with rising insurance premiums and limited coverage options, challenging their ability to afford and maintain adequate protection for their valuable assets.

As more people call these areas home, the understanding of bushfire exposure is crucial for community safety and future development strategies. It is imperative that both new and existing residents, along with local governments, engage in proactive planning and adopt sustainable development practices. These efforts should aim to balance growth with safety, ensuring that communities are both thriving and resilient against potential bushfires.

The enhancement of bushfire risk awareness is about safeguarding properties, protecting lives, and preserving the unique character of these communities. As we look ahead, the focus must be on fostering a culture of preparedness and resilience, equipping communities with the knowledge and tools necessary to navigate the challenges posed by an ever-changing climate. By prioritising these aspects, Tasmania can ensure a safer, more sustainable future for all its residents.

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About this document

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The bushfire hazard data and information provided in this report are for general reference only and should not replace specific professional advice. This data does not cover all factors pertinent to determining actual bushfire hazards, and users acknowledge and accept that:

- The data is not based on site-specific investigations specific to individual properties regarding bushfire risks.
- The bushfire hazard data does not constitute a detailed report and does not replace the need for property-specific inspections regarding bushfire-related conditions.
- The information and data contained within the bushfire hazard data are compiled from various third-party sources and are not exclusively sourced from Geoneon.