Bushfire resilience in the Great Southern, Western Australia

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Activities to manage bushfire risk in the rural–urban interface are often guided by local knowledge, policy and best practice. While these activities are well-intentioned, there is a need to prioritise work and measure effectiveness before resources are expended. Using scientific methodologies and new technologies, this project provides a scientific basis for mitigation activities to reduce bushfire risk.

Under the State Hazard Plan for Fire[1], an integrated Bushfire Risk Management Plan must be developed for local government areas that have significant bushfire risk. This plan identifies and assesses risks from bushfire across multiple tenures and asset classes.[2] The Great Southern region, particularly the local governments of the City of Albany, Shire of Denmark and Shire of Plantagenet, has a varied demographic with nodes of high seasonal population fluctuations. This, in combination with topographical constraints and unique vegetation types, requires additional analysis of evacuation routes and assessment of risk to create confidence in the community in managing bushfire risk. Local emergency management committees report to district committees and make recommendations about evacuation locations. However, these committees are often under-resourced and under-informed to make these recommendations.

Eight precincts across the 3 local governments were chosen for this project. The process involved science-based methodology to guide decision-making around the management of risk. Each precinct was assessed to ascertain current road networks and possible vulnerabilities in a bushfire event. The data included reviews of local roads standards, road widths and road hierarchy information. The assessment looked at access and egress for future public roads, cul-de-sacs and turn-around capability, emergency access routes and access ways. The output identified mitigation activities, funding and future town planning requirements.

The precincts were assessed to ascertain current water storage, servicing and possible vulnerabilities during a bushfire. The review included government supplied water hydrants, infrastructure and water current capacity through water corporation procedures for servicing, filling and sustaining. It also included bushfire brigade sheds in the precinct and other infrastructure. Gaps identified were GIS-mapped for spatial representation. The method of assessment and recommendations followed the PACE procedure: Primary, Alternative, Contingency and Emergency, for each precinct.

Bushfire risk assessment

The project used the CSIRO[3] bushfire modelling toolkit, SPARK. The software is fully configurable, which allowed for ignition scenarios and configurable inputs such as rate-of-spread models, weather and fuel parameters. In addition to informing the risk assessment, the outputs could be incorporated into other deliverables such as the evaluation of access, water supplies and emergency shelter options.

The likelihood and consequence of bushfire attack on life and property is typically influenced by landscape, locality and site-specific factors. The bushfire risk assessment undertaken for the precincts was based on analysis of:

- landscape risk
- locality risk
- building risk.

Landscape risk

Two forms of analysis were used to determine landscape bushfire risk: burn-perimeter analysis and bushfire rate-of-spread analysis. The burn-perimeter analysis was used to assess the degree of potential bushfire exposure from bushfire attack scenarios arising from different wind directions. The burn-perimeter analysis modelled the fire spread from a set of ignition points using different wind directions and tallied the quantity of the resulting fire spread models at each point across the landscape. The bushfire rate-of-spread analysis was used to assess the potential bushfire spread and speed in different bushfire attack scenarios. This provided insights into the potential time to impact within the precinct as well as the road network giving access to or from the precinct. The analysis was made by computing fire spread scenarios from a set of distant ignition points for differing wind directions. The fire spread models were collated, indicating estimated bushfire rates of spread for each point across the landscape.

Inputs used were:

- weather: FDI of 80
- wind directions: ESE, SW and NNW
- fuel: vegetation mapped by Kinnear & Panickar (2020)[4] and manually converted into AS3959:2018 classes
- fuel parameters associated with each vegetation class as per AS3959:2018
- mapped buildings for the precinct
- ignition points:
    - burn-perimeter analysis: a grid of ignition points was applied regularly (250 m spacing) within a 5 km buffer line from the buildings within the precinct and ignited sequentially
    - bushfire rate of spread analysis: a ring of ignition points was applied regularly (100 m spacing) along a 5 km buffer line from the buildings within the precinct and ignited in parallel.

Ignition points were moved closer to the precinct in areas where the 500m buffer would place an ignition point in the water, a non-vegetated area or an area of vegetation separated by a significant body of water.

Locality risk

The analysis of locality risk assessed the quantity and degree of bushfire hazard in the immediate locality of buildings in the precinct as a measure of the increased potential for severe bushfire attack. For locality risk, bushfire intensity models were generated for different attack directions.

Inputs used were:

- mapped buildings of the precinct
- a ring of ignition points, spaced 100 m apart and buffered by 500 m from the buildings within the precinct and ignited sequentially
- weather and other inputs from the landscape risk
- ignition points moved where required as detailed in landscape risk.

Risk ranking

A risk analysis process was undertaken to assess the comparative level of risk exposure for each precinct. The intent was to establish a risk-based ranking so that risk treatments across the 8 precincts could be prioritised. This risk analysis was achieved by assigning each risk assessment (landscape, locality, building and evacuation) for each precinct a score, standardising the scores and then classifying these into a 5-class grouping (ranking) using the Natural Breaks (Jenks) data classification approach.

Community engagement

Community engagement was important to the success of the project and involved community groups, interested parties and precinct residents during site assessments. A total of 235 people attended 8 community information sessions. Information and feedback from these sessions guided the final precinct reports and overarching report. Information sessions were held with representatives from fire services, land management agencies, non-government organisations and related associations.

Results

The study confirmed that the 8 precincts are at extreme risk of bushfire and the capacity of people in these precincts to evacuate is compromised under differing bushfire scenarios. The communities at risk were involved during the project and requested more collaborative community, stakeholder and government agency interaction.

Successful implementation of the project recommendations is subject to funding either at local, state or Australian Government levels. Current funding is limited to state agency funding on public lands through a mitigation activities fund. Focus areas are presented as a road map forward with an emphasis on shared responsibility.

The project outlined a scientific methodology for asset-based bushfire risk assessment. The methodology is tenure blind and identified the need to enhance and refine bushfire protection measures at the point of the asset ahead of extreme bushfire events. Additionally, it provides a road map for targeted, measurable and quantifiable outcomes to reduce

End notes

1. Government of Western Australia 2020, *State Hazard Plan for Fire. At: https://semc.wa.gov.au/emergency-management/plans/state-hazard-plans/Documents/StateHazardPlanFire.pdf.*

2. Government of Western Australia 2020, *Guidelines for Preparing a Bushfire Risk Management Plan 2020. At: https://www.dfes.wa.gov.au/waemergencyandriskmanagement/obrm/Documents/Guidelines-for-Preparing-a-Bushfire-Risk-Management-Plan-2020.pdf.*

3. The Commonwealth Scientific and Industrial Research Organisation is an Australian Government agency responsible for scientific research.

4. Kinnear & Panickar 2020, *Client projects. At: www.biodiversesolutions.com.au/projects.*

