

2026-27 HIVE Summer Internship Project

Spatial analysis of the DFES Bushfire Training Programme

Primary Academic Supervisor

Dr. S Zaung Nau

Project Background

The Bushfire Centre of Excellence training team develops and delivers year-round bushfire training for a wide audience across the state. They promote localised training delivery through the hub and spoke service delivery model, and support a network of trainers across the state, delivering training from Esperance all the way up to Kununurra.

The aim of this project would be to assess how effectively the hub and spoke model is working in delivering training across the state and not just across the metropolitan area.

The project would involve spatial mapping of Trainer and Assessor locations, Trainer and Assessor qualifications, training products delivered by location, and student participation by location. Information on DFES staff and volunteer numbers by location would also be mapped to provide denominators.

This information could be analysed alongside hazard and risk data (maybe the number of level 2/3 fires over the last 5 years?) to identify areas with known risks but lower levels of training engagement or capability to attain training.

The intended outcome is to develop a data-driven decision tool that helps inform our planning around trainer upskilling priorities, training delivery location enhancements and targeted education or communication campaigns to ensure training is getting to where it is needed most. Ultimately, the project aims to support a more proactive approach to developing our staff, volunteers and community risk reduction.

Project Description, Expected Outputs, Possible Stretch Goals

1. Trainer & Assessor Capability Maps (Supply Side) to measure local training capacity and identify single points of failure in regional networks.

- Trainer & Assessor Geographic Footprint: Point/cluster map showing physical locations of active, endorsed Bushfire Trainer/Assessors across DFES regions
- Qualification & Delivery Scope Matrix Map: Categorized points or regional choropleth maps displaying trainer qualifications (e.g., qualified for Level 1 Crew Member vs. Level 2/3 Sector Commander, Prescribed Burning, or Specialist Incident Management).
- Trainer Activity & Recency Heatmap: Intensity map showing active vs. dormant trainers based on courses delivered over the past 12–24 months, highlighting areas dependent on a single overworked local trainer.

2. Operational Baseline & Participation Maps (Demand Side) to map workforce presence and trainees participation to create regional training rates.

- Workforce & Volunteer Baseline Density Map: Polygon/choropleth map by Local Government Area (LGA) or Bush Fire Brigade (BFB) / State Emergency Service (SES) / Career Fire and Rescue Service (CFRS) boundary showing total volunteer and staff headcounts. This serves as the denominator for capability ratios.
- Trainees Participation & Course Completion Map: Graduated symbol map showing student throughput (course completions) per location across key course pathways (e.g., Bushfire Fundamentals, Rural Fire Awareness, Brigade Officer Development).
- Training Equity & Engagement Rate Map: Ratio/choropleth map calculating $(\text{Trained Personnel} \div \text{Total Personnel})$ per brigade/LGA to identify regional pockets with low training uptake relative to their force size.

3. Strategic Gap & Decision-Support Maps to combine supply, demand, and risk to directly answer where to target resources.

- Hub-and-Spoke Service Catchment & Travel Buffers
- Risk vs. Capability Deficit Heatmap
- Targeted Upskilling & Pathway Needs Map:

Links to background reading and any relevant recent work in the field

- O'Kelly, M.E., 1986. The location of interacting hub facilities. *Transportation science*, 20(2), pp.92-106.
- Chan, Y., 2001. *Location theory and decision analysis*. South-Western College Pub..
- Tong, D. and Murray, A.T., 2012. Spatial optimization in geography. *Annals of the Association of American Geographers*, 102(6), pp.1290-1309.

What type of visualisation will the student develop or produce?

Interactive geospatial mapping for the expected outputs listed

How will the visualisation contribute to your research outcomes?

- Evaluation Framework for Regional Education & Training Networks
- Spatial Equity & Accessibility Assessment: Quantify the "spatial friction" and geographic disparities in emergency services training across metro vs. regional/remote zones (e.g., measuring travel-time burdens via drive-time isochrones).
- Validation of the Hub-and-Spoke Delivery Model: Generate empirical evidence testing whether the hub-and-spoke architecture effectively decentralizes training capacity or inadvertently creates reg

If the project is successful, where would you consider publishing the results?

Evaluating spatial equity in emergency service training (Hub and Spoke analysis) in *Applied Geography* or *Journal of Transport Geography* with Network analysis, Isochrones, travel time catchment analysis.

Bridging the capability gap: bivariate spatial modelling for bushfire hazards vs local trainer availability in *International Journal of Disaster risk reduction* or *Safety Science* with spatial autocorrelation, bivariate choropleth, hotspot analysis (Getis-Ord Gi*).

Optimising volunteer emergency workforce development in remote regions in *Public Management Review journal* with location-allocation modelling, capacity ratio analysis.

Draft Project Timeline:

Week 1

Nov 16 - Full day HIVE induction

Nov 17 - Area and Project Induction with Primary supervisor

Develop project plan with HIVE and academic team

Literature and relevant project review

Project Familiarisation

Week 2

Project Scoping, Data Acquisition & Framework Setup

Week 3

Capability & Supply Mapping (Trainer Footprint) Point Pattern & Cluster Analysis, Trainer Activity & Recency Analysis, Single-Point-of-Failure (SPOF) Vulnerability Analysis

Week 4

Demand & Participation Mapping (Workforce Baseline), Workforce Density Aggregation, Student Throughput & Output Mapping, Training Equity & Engagement Rate Calculation

Week 5

Spatial Integration & Hub-and-Spoke Analysis, Isochrone Drive-Time Buffer Analysis, Bivariate Deficit Mapping (The Core Priority Analysis), Location-Allocation Optimization Modeling, Capability Gap Matrix Analysis:

Week 6

Development of draft Decision-Support Tool, end user feedback

Week 7

Working with end user for iterative improvement

Week 8

Working with end user for iterative improvement

Week 9

Focus on report writing and presentation (including demo) preparation

Week 10

Focus on report writing and presentation (including demo) preparation

5th Feb Final Showcase Day and final report due

Student Experience and Supervision:

How often will you meet with the student over the 10-week period?

4-5 times in first week, once a week in week 2 and 3 (online), 2-3 times a week for the rest

Your work desk location and the location of student desk

402 level 5

Student Attributes:

Please indicate any preference for student's academic discipline or field of study

Any discipline with good technical skills on data structure, analytics and statistical modelling, GIS or any geospatial analysis skill is preferrable

What competencies are required to start this project

Advanced - Data structures, analytics, statistical modelling

Advanced - GIS spatial mapping (ArcGIS, QGIS)

Do you have any other student attributes you think are important to the project?

NA