

Reconstruction: Sourcing and Supply of Materials

Introduction

On January 4th, 2020, the Kangaroo Valley region was hit by the Currowan Fire, part of the 2019/2020 bushfire season now often referred to as the Black Summer. The Currowan Fire began on the 26th November 2019 more than 100 kilometres south of Kangaroo Valley. It would eventually burn for 74 days across 320,385 hectares. The fire directly impacted approximately 100 properties where it is estimated that over 130 substantial structures were destroyed, including around 48 dwellings (which represent roughly 10% of homes in Kangaroo Valley).

In recovering from a major bushfire, the construction industry plays an important role in both the immediate clean-up and recovery, as well as the longer term reconstruction of damaged homes and infrastructure. The construction supply chain is known to be complex, typically made up of a fragmented network of interrelated stakeholders and activities, which often faces significant resourcing and cost challenges following natural disasters.

As part of this research project, we sought to better understand how key aspects of the reconstruction supply industry responded to the rebuilding requirements of Kangaroo Valley in particular, while also considering wider impacts across the NSW South Coast region.

Figure 1 shows the key elements of the construction industry, which operates within a changing technical and policy context. Within this context a typical construction/rebuilding project will involve

a number of stages including planning and design, sourcing materials, making components, and finally the delivery or building of the final structure for the end user.

This document is one of several *Bushfire Research Briefs* that summarise research findings by the University of Wollongong (UOW) research team regarding the Kangaroo Valley community's activities and perspectives regarding bushfire-resilience.

In-depth interviews were conducted with over fifty interviewees, including Kangaroo Valley residents, business owners and tradespeople from the NSW south coast, RFS volunteers and local service providers. Through these interviews we explored the construction supply ecosystem servicing Kangaroo Valley in order to understand the issues faced by the supply chain since the 2019/20 bushfires.

This particular *Bushfire Research Brief* focuses on the 'sourcing' and 'making' elements of the construction process (Figure 1). It focuses on materials sourcing impacts throughout the rebuilding phase of disaster recovery, supply and distribution networks, and innovations in the manufacturing and production of buildings. Other aspects of the building reconstruction process are discussed in separate briefs. As this research was undertaken during 2020 and 2021, the multitude of impacts from the COVID-19 pandemic and responses are also considered in relation to bushfire recovery.



A combination of smoke from the remnants of the Currowan Fire burning in Bundanoon Creek and a dust storm sweeping in from western NSW, January 2020, seen from the hydroelectric power station in the north western part of Kangaroo Valley (photo – Paul Cooper).

Issues for the construction supply chain in rebuilding

One of the key objectives of the research project was to better understand the impact on the reconstruction supply chain of the sudden onset of rebuilding of homes, and repairs to damaged homes, following a major bushfire.

Following the 2019/2020 Black Summer Bushfires the building industry experienced record high demand for new housing – the

number of new homes commencing construction in 2021 was 20% higher than the previous record in 2018¹. Material shortages caused significant supply chain issues for the construction industry. The industry was hit by the double impact of very strong demand for housing materials, at the same time as having a weak supply. In addition, the national and international response to the COVID-19 pandemic significantly impacted housing construction demand and materials supply

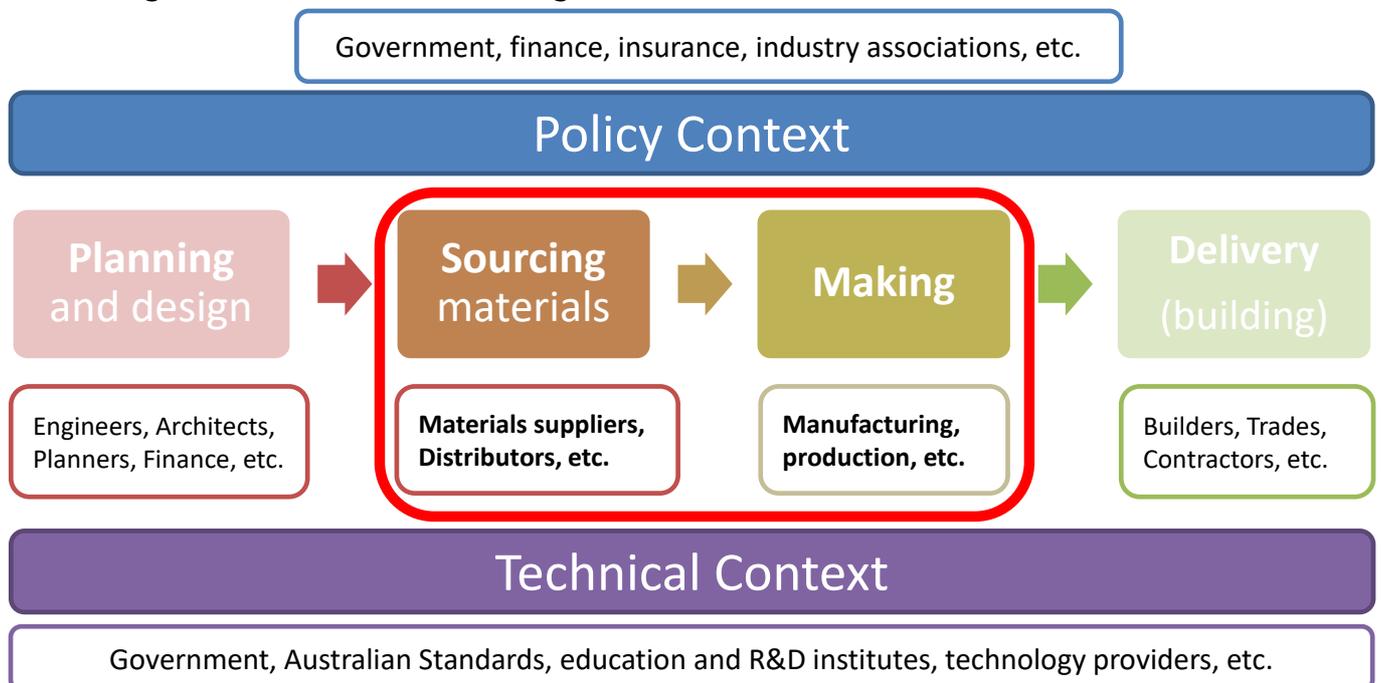


Figure 1. A schematic representation of the key elements of the building reconstruction process and ecosystem. This Bushfire Research Brief focusses primarily on the elements highlighted in the red rectangle.

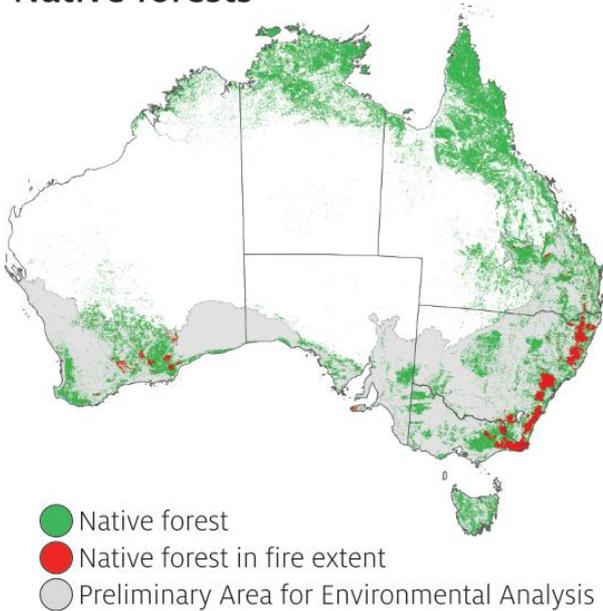
¹ <https://www.abc.net.au/news/2021-06-21/australia-victoria-housing-building-boom-timber-supplies-cost/100229612>

“Mills burning, forests burning, and enormous demand. And probably the biggest of those is enormous demand.” (Supplier)

The timber industry was one of the most important sectors of the construction supply chain that was directly impacted by the Black Summer Bushfires, resulting in major shortages of both softwoods and hardwoods. The fires caused significant damage to native and commercial forests. 8.3 million hectares of native forests were affected, together with 130,000 hectares of commercial plantations and 22,000 hectares of other forests (see Figure 2)².

On a regional basis, approximately 40% (50,000ha) of softwood plantations in the South West Slopes and Bombala regions of NSW were burnt, and across NSW almost 25% of both softwood and hardwood plantations were within the extent of the fires³. The damage to commercial plantations in particular put the timber supply system under significant pressure.

Native forests



“Materials is a major, major issue. Every phone call I get it's always about materials, lack of. There was a lot of forest burnt in the fires.” (Industry association)

In the short term following the fires, the damage to timber processing mills located throughout south-east NSW caused a decline in supplies. According to regional peak organisations, two mills were burnt on the far south coast, with only one of them reopening to process timber. In Braidwood, one shed and machinery from the mill was burnt, and it took some time to return to normal operations. Mills struggled to keep up with demand.

Once mills began returning to normal operation, there was plenty of timber in the short term, and actually, an urgency to process burnt plantation timber before it became unusable.

Plantations

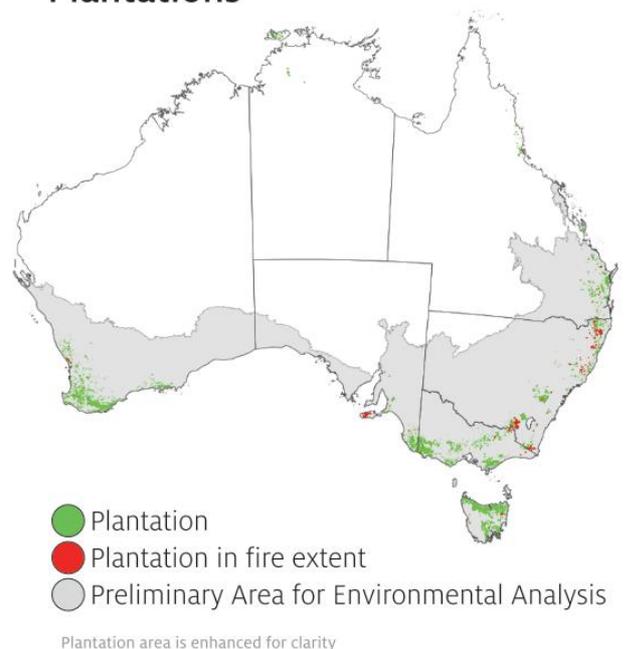


Figure 2. Extents of native and plantation forests affect by the 2019-20 bushfires².

² Whittle, L., 2020. Analysis of effects of bushfires and COVID-19 on the forestry and wood processing sectors. Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra.

³ Commonwealth of Australia, [Aussie Logs for Aussie Jobs](#), 2021

Processing of burnt timber continued until mid-2021, so it is expected that the longer-term impacts of damage to plantations will become more evident in the supply chain from late 2021 onwards. Bushfire impacts will be felt for a long time. For example, suppliers reported that one NSW pine plantation company that was impacted by fire expected it would take 4 to 5 years to fully recover. Across the state, the NSW government has plans that target a return to pre-bushfire levels of plantation tree stocks within 10 years

Shortages occurred throughout 2020 and 2021, and were still occurring at the time of writing (November 2021). These affected both softwoods, such as pines used for structural aspects of housing (framing and trusses), and hardwoods used for decking and bearers. These shortages appear to have affected different regions of South Coast NSW at different times. Contributing factors for this uneven distribution may have been related to activities at local timber mills, and wider housing demand, with softwoods used more heavily in the early stages of construction, and hardwood towards the end.



Fire damaged plantation (Photo - Chad Peltola on Unsplash).

Implications for rebuilding

As a result of both bushfire and COVID related shortages, interviewees reported increases in material sourcing lead times, price increases, increased risk and uncertainty for builders and suppliers, and even hoarding of materials.

Builders and suppliers faced greater business uncertainties and risks when material costs and availabilities kept changing rapidly. Suppliers and industry organisations were recommending that builders include clauses in contracts noting that material prices could increase by up to 20% above the quoted prices, and reducing the time for which their quotes would be valid, so as to manage price uncertainties and increased risks of delays in construction.

"They [suppliers] just keep saying, "We don't know when it's coming. No one can tell us. We get a pack [of timber] here or there"... but no one says it's coming, or it'll just turn up, and then we won't have anything for a few weeks."

(Builder)

Large building materials suppliers servicing the Kangaroo Valley region reported that they more than doubled the number of suppliers in their network to secure enough timber.

Major builders reported that they were buying timber from the local Bunnings warehouse to pass on to their framing suppliers, because they were not able to secure enough supply on their own. This points to increasing complexities that developed in the supply chain to address the shortages, increasing lead times for reconstruction and costs involved along the chain.

"So I spent probably, each day for three days, five hours..., just on the phone to our suppliers trying to secure supply [of timber] and make sure that we're on track to get what we need."

But it's not easy work." (Supplier)

Interviewees told of companies in the more remote parts of the South Coast buying large quantities of timber to hoard for their own building needs – described as the 'toilet paper response'.



Roof trusses and framing timber supplies have been affected by timber shortages (Photo – William Milner).

While this suggests significant issues were faced by some builders, these types of delays and price changes were reported as being characteristics expected of construction management. Whilst supplies might have been delayed, these issues could be managed to a certain extent by prioritising a particular aspects of the construction of a building until supplies for other aspect became available. This does therefore indicate a degree of existing resilience in the construction supply chain to adapt to setbacks that arise.

“Time delays as well, for clients. That’s our biggest thing. Building times are blowing out from ... what they were a year ago... A couple months each house, type thing, because of the wait time on all the materials and everything like that. We used to be able to get something at a seven day turnaround. [Now] Sometimes it’s a five week turnaround.” (Builder)

COVID-impacted material sourcing

It is impossible to consider building reconstruction following the Black Summer bushfires and the performance of the construction supply chain without considering the very significant influence of the COVID-19 pandemic and associated response of the Australian Government on housing construction demand and materials supply in 2020 and 2021.

Multiple factors coincided to impact demand for, and supply of, construction materials. At the time housing demand was being driven by:

- Low interest rates impacting housing investment;
- COVID stimulus money (homebuilder scheme);
- Migration of people from cities towards regional areas (with associated renovations or new-builds); and
- The fact that people who had not been financially impacted by COVID often had increased personal financial savings available due to travel restrictions and lockdowns.

At the same time, supply of a wide range of materials was also impacted by:

- COVID-related border and trade restrictions (reducing or slowing importation of materials); leading to
- Increased shipping costs, particularly as reduced international trade raised the cost of shipping container space, making some less profitable products uneconomical to import; and
- Construction booms in other parts of the world, particularly the USA, placed additional demand on resources.



Cost of international shipping increased significantly in 2020/21 (Photo - CHUTERSNAP on Unsplash).

COVID-impacted material shortages hampered rebuilding efforts, with interviewees mentioning difficulty

obtaining everything from door furniture, bathroom fittings, light fittings, and drainage pipes to steel and timber.

COVID-related impacts on timber supplies can largely be attributed to two key factors. Imports of Baltic pine were reduced dramatically. Normally this timber makes up roughly 15%-20% of the supply to the frames and trusses industry. So this restriction placed additional stress on the domestic timber supply chain. At the same time, a housing construction boom in the USA consumed timber supplies that could otherwise have been imported to make up for the domestic shortfall.

Construction innovation

Innovation in the construction supply chain in response to the challenges of post-bushfire rebuilding was a particularly area of interest for the University of Wollongong research team.

A number of interviewees spoke about the use of prefabricated or modular construction building solutions - part of the 'Making' stage of construction, as illustrated in Figure 1.

The potential benefits of this kind of construction include the fact that manufacturing components, or entire homes, in a factory setting can potentially deliver quality housing significantly more quickly. There are several reasons why this benefit is particularly suited to post-disaster rebuilding. Speed of delivery, for example, can be particularly important for people who find themselves without a home, and relying on temporary accommodation or the hospitality of others while waiting for their home to be rebuilt. Prefabricated homes can also be constructed away from disaster impacted regions, drawing on a workforce that has not been directly impacted, or that potentially is also occupied with clean-up work.

Materials supply immediately post-bushfire

Immediately after the fires, local suppliers reported a surge in demand for materials related to irrigation (plumbing fittings, pipes, hoses, etc.) as fire-impacted households rushed to restore water to their properties.

This became an important issue as local retailers ran out of key items, and this extended upstream further into the supply chain, taking a number of weeks to restock.

A large number of plastic water tanks on fire-impacted properties were burnt and had to be replaced. The replacement lead-time on these was roughly 1-2 months, which was judged as pretty normal for water tanks by the suppliers. Many people changed from plastic to less combustible steel or concrete tanks, though many steel tanks were also damaged or destroyed in the fire.

Understanding and improving preparedness for shortages of the most critical materials and equipment items is key to facilitating a faster post-disaster recovery.



Destroyed water tanks (photo - Mark Bugden).

The conventional housing finance sector is geared towards making progress payments at particular milestones in construction. Prefabrication and off-site construction of buildings or building components requires a high up-front payment to cover manufacturing costs, which is judged high risk by many lenders. This is less of a barrier during post-disaster rebuilding when households will have access to insurance

payments and will not be as reliant on lenders for construction finance.

However, uptake of prefabricated construction was minimal in the Kangaroo Valley area. One community member was working with a local builder on a bespoke modular construction based on a typical construction site shed module. Most other rebuilds were working within the conventional on-site construction industry.

One concept being explored, was the use of modular construction to quickly establish a new dwelling on a bushfire damaged property, with the possibility of later converting this building into a holiday rental or second dwelling. This would allow households to return to their properties relatively quickly without requiring final decisions on rebuilding a lost home in the immediate aftermath of a traumatic event.

Prefabrication was more prevalent in the Far South Coast region, where one company established a factory targeting bushfire rebuilding work, with a number of houses pre-ordered; the aim being to produce two houses per week once full operational capacity was reached. The benefits of this are obvious in terms of speed, however there are a number of potential issues or obstacles that are preventing greater uptake currently.



Pre-fabricated or modular construction was one construction innovation discussed (Photo - Pixabay).

In Australia, the prefabrication industry is still somewhat immature, with relatively few established players in the market, as compared to leading international practice. This results in a higher risk profile from lender and consumer perspectives. From a practical standpoint, access roads to remote areas are often impacted by bushfires and may pose issues for delivery of modular or prefabricated buildings.

Building supply chain resilience to future shocks

The reconstruction supply chain servicing the Black Summer bushfire recovery effort represents an excellent case study of how multiple natural, or human-induced, disasters occurring at the same time, or within a short space of time, interfere with disaster recovery and reconstruction.

In addition to the bushfires and COVID-19, significant flooding occurred in the Shoalhaven region in January and February 2020. This caused significant damage to roads and bridges providing access to parts of the Kangaroo Valley and Budgong regions, requiring additional repairs before clean-up and rebuilding could continue.

This highlights the importance of considering multiple overlapping disasters in resilience planning at a policy and industry level, particularly as the risk of extreme weather events continues to rise.

One consideration in addressing this issue is the potential to increase local production capacities, along with the shortening and on-shoring of critical supply chains as a resilience response to disaster recovery. Building up alternative production and construction solutions (e.g. off-site prefabrication) provides further options for quickly supplying housing to affected communities. However over-reliance on large prefab housing factories would pose other resilience issues, if these factories were themselves to be affected by disasters.

Summary

Widespread bushfires on the scale seen during the 2019/20 Black Summer can deliver significant shocks to the building supply chain. Timber is both particularly vulnerable, and crucial for reconstruction, but other critical materials and equipment can also rapidly experience shortages in the rush to recover.

The dominant conventional on-site construction industry already operates with a fragmented and dynamic supply chain. This provides a level of resilience to cope with supply shocks. However, greater diversification of construction solutions, through initiatives such as off-site manufacturing and increasing local production capacities, show promise as means to build greater resilience across the construction industry.

Additional Resources

The Renew Green Rebuild Toolkit:
<http://greenrebuildtoolkit.com/>

Whittle, L., (2020). Effects of bushfires and COVID-19 on the forestry and wood processing sectors. ABARES, Insights Issue 6, 2020, Canberra.
<https://www.awe.gov.au/abares/products/insights/effects-of-bushfires-and-covid19-forestry-wood-processing-sectors>

After The Disaster: ABC Radio Podcast
<https://www.abc.net.au/radio/programs/after-the-disaster/>

The CSIRO Bushfire Best Practice Guide:
<https://research.csiro.au/bushfire/bushfire-basics/>

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If this document has raised challenging issues for you, Lifeline Australia provides crisis support 24 hours a day: call 13 11 14 or see <https://www.lifeline.org.au>

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