Coping with climate extremes: Railways and pastoralism during Australia’s Federation Drought

Andre Brett, Simon Ville

Abstract

Transport networks can play an important role in responses to extreme climate events, especially when governments own the network and intervene directly. Railways occupied a central place in Australian rural development by the late nineteenth century, a topic that has been discussed widely by scholars of economic history. Much less is known about their contribution during the severe drought crises faced by rural communities. We investigate the role railways played during the Federation Drought of 1895–1903 in sustaining Australia’s largest export industry, pastoralism. Government ownership of the railways enabled subsidies to be offered for the movement of livestock from drought areas and fodder to those areas. These policies assisted the rapid recovery of pastoral output and contributed to longer-term industry improvements. The intervention, however, came at significant financial cost to the railways, which was borne for the public good as part of an economic developmental purpose. The costs and benefits of drought relief policies continue to be debated today; our study demonstrates the major role transport networks can play in response to extreme climate events, both for immediate relief and in shaping subsequent behaviours.
“By the middle of [18]99 trains were running day and night, transferring nearly a million sheep from the great [pastoral] stations beyond Winton to the eastern Tablelands and the coast, on whose coarse, unsatisfying grasses no sheep had been kept since the early Sixties”¹

1. *Introduction*

Extreme weather can be a catalyst for major historical change, and the course and outcomes of past events are instructive for modern climate debate and policy formation.² The concepts of vulnerability and resilience have currency in environmental history in understanding when communities were particularly exposed to extreme weather events and what resources they possessed to cope with and shape its effects.³ The pastoral communities of inland Australia have been highly vulnerable to the effects of droughts. We investigate the impact of an extreme event, the Federation Drought of 1895–1903, and examine the resilience provided by the exercise of public policy through government-owned railways. This builds on an ‘envirotech’ concern with how technologies such as rail transport framed the interdependence of humans and nature. Railways did not have a one-way effect on the environment: the land and climate also defined railway construction. Sara B. Pritchard and Thomas Zeller suggest that operation also requires attention.⁴ Droughts present sharp insights into how environmental factors alter the daily workings of railways and what the effects of these changes were.

The effects of climate extremes typically require government intervention to assist rural industries during crises and to recover afterwards. Transport technologies such as railways provide the essential connection between producers and customers, and therefore figure prominently in crisis response. Railways in Australia have, for most of their history, been owned and operated publicly, so the study of them provides direct insights into the contribution of government policy. The first lines in the 1850s were planned as private endeavours but they passed into public ownership quickly when the railway companies could not raise sufficient capital to provide a service of clear utility to the burgeoning colonies.\(^5\) By the 1870s the question of ownership was largely settled in favour of the colonial governments, who could access greater credit on more favourable terms. The fact that each state developed its own railways independently during the colonial period, and did not pass control to the Commonwealth government at Federation in 1901, adds a comparative element.

The rapid expansion of railways in the second half of the nineteenth century contributed significantly to economic growth in the Australian colonies. Over 20,000km of line were open by Federation carrying nearly 14m tonnes of cargo annually.\(^6\) Government-owned railways were extended inland in the expectation they would play a large role in the growth of rural industries, whose products accounted for more than 80 percent of Australian visible exports. Wool, alone, comprised more than half of exports in the early 1890s.\(^7\) The increasing density of railway stations in pastoral districts and the provision of lower freight rates for longer hauls helped connect rural production to national and international markets. Railways facilitated


regional specialisation of output between city and country, fostered rising land values, and influenced population distribution—an exemplar of Pritchard and Zeller’s “new spatiality of the industrial age”.8 In some rural towns, such as Junee in New South Wales (NSW), the railways were major employers, investors, and a key part of the fabric of the local community. The long-term costs and benefits of railway building policies have been the subject of much scholarly debate. Henry Ergas and Jonathan Pincus summarise a limited quantitative debate about the benefits and costs of railway construction in Australia, and a broader qualitative discussion of whether investment maximised the economic advantages of railways.9 At Federation, it was axiomatic that railways facilitated productivity and population growth. Even critics of specific policies supported the broad trend: Timothy Coghlan, the famed statistician, saw railways as providing great benefits to producers and consumers while condemning largesse in Victoria.10 Later analyses have been more contested. Noel Butlin, doyen of economic history, argued that railways provided few external economies in Australia and, specifically, that fan-shaped trunk lines bypassed many pastoral localities.11 On a broader canvas, he opined that ‘the long run stimulus to private activity from government capital outlays was exceedingly small’.12 Mac Boot built on Butlin to suggest that smaller, leaner railway networks would have provided similar advantages at less cost.13 Contrariwise, Lionel Frost has contested some of these negative assessments, especially for Victoria, while Bruce Davidson’s cost-benefit analysis suggests a healthy rate of economic benefit to New South Wales from the railway.14 Analyses

12 Butlin, Australian Economic Development, 400.
of railways and the rural economy, therefore, mostly take a long-term, developmental approach.

It is at times of shorter-term crisis that the value of the networks becomes most apparent; so, too, does the interplay between the environment and technology. Geoff Raby has shown that transport networks dependent on animal power are especially vulnerable to disruption by drought, and that this provided one compelling reason to construct railways on the Australian continent. It is important, then, to ask whether these networks had the desired ameliorative effect. For eight years, from 1895 to 1903, most of Australia’s pastoral country experienced such extreme dry weather as to create a climatic crisis without precedent in the history of European settlement of the continent. This occurred contemporaneously with the nation-building campaign that culminated in Australian federation, hence the name Federation Drought (hereafter “the Drought”).

In this paper, we examine the effect of the Drought on the vulnerable pastoral industry and argue that state railways provided an important source of resilience in supporting the industry through dire circumstances and in assisting its recovery and subsequent trajectory. Through a range of qualitative and quantitative sources, we show that at a time when stock routes and rivers often could not be used, railways provided subsidised rates that enabled livestock to be pastured away from drought areas, brought animal feed to those areas, and facilitated sequences of destocking and then restocking. Referencing our introductory quotation, approximately one in five sheep in Queensland rode the state-run railway network in the 1899/1900 financial year, compared with one in 20 a year earlier.


2. The Federation Drought

Drought is not easy to define. Deb Anderson, in her oral history of Australian drought experiences, introduces the phenomenon by noting the diverse ways in which it has been understood, from a cultural concept that defines rural Australians as stoic battlers in a “harsh” or “unpredictable” environment to weather and climate attributes that can be measured statistically. Broadly, she notes that drought is usually constructed as a rural event in Australia—her criticism is valid, and this article, in studying a rural industry, does not intend to elide that drought is also a very urban phenomenon.16 Drought conditions, to take the meteorological approach, are typically measured by the deficiency of rain in a sub-period from its average across the whole period. James Foley’s ground-breaking contribution explained the possible methodologies, calculated a drought severity index, and applied it to Australia up to 1955.17 The Federation Drought encompasses a period during about 1895–1903 in which a series of very low rainfall years occurred in unusually close succession, especially in 1895–97 and 1899–1900. By far the worst year, however, was 1902; the cumulative effects of multiple deficient years only deepened the crisis.18 Pastoralists were particularly vulnerable to this pattern of rainfall deficiency—while sheep could generally survive an occasional bad season, the recovery of the flock size after several bad seasons took much longer than replanting annual crops the following season.19

As well as rainfall variations between years, the timing and severity of drought conditions differed among colonies, for example colony-wide drought began earlier in NSW, c.1896, than Queensland, c.1899, though some earlier regional droughts in Queensland’s interior were harbingers, especially in the pastoral district around Cloncurry. Moreover, the rainfall deficiency was greatest in the more inland areas, such as Western NSW, where average rainfall was already modest. Wind erosion accompanied rainfall deficiency. A geophysical study of a peat mire in the Snowy Mountains shows that rates of dust deposition peaked during the Federation Drought; Stephen Cattle’s complementary analysis suggests topsoil erosion, sand drift, and dust storms were comparable with the US Dust Bowl of the 1930s.

Other writers have paid more attention to the economic effects of the Drought, particularly on rural industries, noting the importance of the timing of rainfall and the nature of production in the region. A recent study of 1902–03 evaluated the severity of the Drought across NSW through changes in the wheat harvest by county and the volume of wheat despatched from each railway station. While Foley and others drew attention to broad regional differences in the Drought, this study shows its highly differentiated economic effects at a local level. Where severity indices reveal differences between neighbouring counties with apparently similar rainfall, the authors suggest that variations in the timing of the rain mattered.

Although the Drought remains one of Australia’s greatest post-1788 environmental crises, it has never received the sustained treatment of a monograph—not even as environmental history

23 Tierney et al, ‘Three Raindrops’.
has become mainstream. Alessandro Antonello and Tom Griffiths have both studied the environmental history of the Drought in NSW. Antonello shows that rural settlers gained deeper understandings of the land and its climate during the crisis but government land regulations failed to incorporate new knowledge. NSW’s “legal maze” of land laws aimed to place more smallholders on the land without consideration of cyclic seasons or soil quality, and these politically-motivated policies for closer settlement endured. Griffiths does, however, show one advance in political attitudes from 1884 to 1901: the arid lands of western NSW changed from “a blank canvas, a legislative playground, a stage for an epic battle between classes” to “a disturbingly active agent to be wrestled with in its own right”. And wrestle they did: governments saw investment in capital works as the means of overcoming the challenges of a dry climate. Emily O’Gorman, for example, uses the Drought in her history of the Murray-Darling Basin to show how it influenced the emergence and scope of river engineering projects. Likewise, the Drought figures in Robyn Ballinger’s water history of northern Victoria as a catalyst for state irrigation works and the breaking-up of large estates.

Don Garden situates the Drought within a cycle of three closely-spaced El Niño events. It represents colonial Australia’s most challenging experience of the El Niño Southern Oscillation, an irregular periodic variation of warm and cool temperatures over the Pacific Ocean. Garden suggests that the Drought contributed to the success of referendums for Federation: it highlighted the economic benefits of political unity in times of crisis and forged a collective “Australian” identity through a shared intercolonial suffering. But the Drought, as Katie

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Holmes and Kylie Mirmohamadi have shown, also defined distinctive local identities. In Victoria’s Mallee, it proved a reckoning that tied settlers’ identity to the climate. Farmers, no longer the British colonist enjoying seasons of plenty, were a hardy local type able to endure water scarcity and government indifference.\(^\text{30}\) That indifference is, perhaps, sometimes overstated in Holmes and Mirmohamadi’s sources—the railways played a major role in sustaining regional communities and industries. Both Rebecca Jones and Jenny Keating have shown the crucial role of water trains in the Drought: daily services ran from Bendigo to Mallee towns, with individual farmers collecting water from railway stations sometimes as regularly as twice a week.\(^\text{31}\)

The role of railways extended much further than supplying water. At this time, almost every mainline railway in Australia was state-owned. The only notable private line to pass through drought-stricken pastoral areas was the Deniliquin and Moama Railway—and it was private because NSW would neither build a government line to feed the Victorian network at Echuca nor permit Victoria to extend its railways north of the Murray.\(^\text{32}\) Historians of drought emphasise that the phenomenon is no respecter of borders: Michael McKernan, lifting from Banjo Patterson, calls it the “red marauder”, a villain that “knew nothing of state boundaries”. Borders, however, set the geographical limits of each government’s intervention. McKernan suggests that “responses were consistent across the board … even though people did not publicly refer to initiatives elsewhere”, but takes this little further than fundraising relief

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\(^{32}\) Two decades after Federation, NSW and Victoria finally reached an agreement to extend Victorian lines into the Riverina, the *Border Railways Act* (NSW 1922 no.16), under which the Deniliquin and Moama Railway was purchased and incorporated into the Victorian network. G.H. Eardley, “The Deniliquin and Moama Railway Company”, *Australian Railway Historical Society Bulletin* 12:280 (1961): 21–28.
efforts. The railways provide another case in point. None of the Drought-era inter-colonial conferences of railway commissioners (1899, 1900, and 1901) co-ordinated strategy or formal sharing of information. Yet, as we will see, they acted in similar ways by running extra trains, discounting rates, and carrying fodder, for their operations possessed a shared developmental rationale. Our study takes in NSW, Queensland, and Victoria, the three main pastoral states with more than 80% of Australia’s sheep—and the largest railway networks. We also note some effects in South Australia, but its pastoral holdings were smaller and less affected overall.

3. The effect of the drought on the sheep and wool industry

After decades of consistent growth, sheep numbers in Australia collapsed during the Drought. From a peak of 106m in 1891, their numbers halved to 53m at its nadir in 1902, with most of this fall occurring after 1894. While the 1891 figure was not surpassed until 1930, most of the loss had been reversed by 1910. The poor quality of pastures also meant that sheep were generally smaller and weaker during the Drought. All the major sheep-rearing colonies experienced population decline, but the percentage and absolute falls were greatest in NSW and Queensland. In NSW, the most important location of sheep farming, numbers fell from 61m to 26m, 1891–1902, with the largest drop of 13m occurring in the final year of the period. When the Drought took hold across Queensland, the consequences were swift and severe: sheep numbers halved, 1898–1903. Within individual colonies, losses were generally greatest in the inland areas. These areas not only experienced very low rainfall but, in the Western Division of NSW in particular, pastoral settlement had expanded rapidly in the optimistic 1880s, supported by large loans. Government aid and investment had encouraged settlers to push into

34 *Statistical Handbook of the Sheep and Wool Industry* (Canberra: Bureau of Agricultural Economics, 1949), 1.
dry areas removed from major waterways, with railways an important component. In many cases, stocking levels per acre were excessive, suited more to better-watered coastal regions. There was little margin for error for these new farmers. The Western Division’s share of the NSW sheep population halved by the end of the Drought from 23 to 11 per cent and never regained that share.

Not surprisingly, the production, sale and export of wool all fell heavily during the Drought. Greasy wool production fell, peak to nadir, by just over a third from 638m lbs (pounds weight) in 1892 to 408m lbs in 1902. By 1907, only five years later, production had returned to pre-Drought levels. The lower proportionate losses compared with livestock numbers are mostly explained by high death rates among lambs. As per sheep numbers, output falls were spread across the major producing colonies but the greatest declines were in NSW and Queensland. The Drought, and the consequent increase in bushfires, adversely affected the quality as well as the quantity of wool because of the dry dusty conditions and the poor health of many sheep, particularly in the inland districts. Goldsborough Mort, one of the leading woolbrokers, described the 1898 clip as “deficient as regards growth, length and strength, as lacking in robustness and density, the staple being thin, poor in yolk and in wasting condition, burr and grass seed being very prevalent”.

Sheep farmers in Drought-affected areas faced enormous financial pressures. Wool sales were lower: prices remained strong to begin with, but fell substantially by 1900. Fixed costs,
especially capital investments, had to be spread over a smaller income, and some operational costs rose including feed expenses and keeping animals free from dust.\textsuperscript{41} In many places, the continued expansion of previous decades had led to rundown pastoral stations and an aging sheep population, many of which, in the opinion of the \textit{Australasian Insurance and Banking Record}, were fit for little more than boiling down.\textsuperscript{42} Indebtedness increased rapidly in the 1890s and many stations reverted to management and ownership by financial institutions.\textsuperscript{43} The financial effects varied significantly between areas according to the seriousness of the Drought. In less affected coastal areas there were actually financial benefits from receiving starving sheep to graze, while those coastal farms also producing crops benefitted from the rising price of stockfeeds such as hay, barley and chaff. The effects also varied within Drought areas according to the nature of ownership. Those with highly leveraged debts were most at risk. At the other extreme, company-owned stations benefitted from greater financial resources to fall back on and the ability, in many cases, to shift animals to their other stations in less affected areas or to bring in feedstuff from these properties.

Destocking and restocking of animals is a common practice of farmers in response to climatic vicissitudes. Thus, in years of low rainfall, faced with denuded pastures and rising stockfeed prices, sheep farmers might reduce flock sizes to save costs and yield liquid funds from which to purchase food for the remaining animals. The disadvantage, however, was a smaller ‘wool cheque’ in the following season. Therefore, restocking once the drought appeared to have ended was imperative. Timing was everything: selling livestock before they deteriorated too far and prices fell in a selling market, and restocking before livestock prices rose as other pastoralists responded to improved conditions. For those pastoralists unable to turn to the resources of

\textsuperscript{42} Butlin, \textit{Australian Economic Development}, 177.
\textsuperscript{43} Boot, ‘Debts, Drought and Foreclosure’: 52.
company ownership, the local stock and station agent provided advice on stocking levels. Sometimes sales were not a realistic option for older and sick animals, who were killed, allowed to die, or sent for boiling down.

4. Transporting the Wool Trade

Export opportunities drove the rapid growth of Australia’s wool-growing industry in the nineteenth century, typically consuming over 90% of production. Britain was the initial focus of exporters but, by the end of the century, overseas markets included Western European nations such as France and Belgium, and, increasingly, Japan. Wool was transported from the farm gate to the major export ports, particularly Sydney, Melbourne, Adelaide and Brisbane, where it was consigned for sale overseas. Rail, road, and river and coastal shipping all conveyed the wool clip to export. With the expansion of inland settlement, land transport increasingly superseded coasting. Roads were often of poor quality and railways outpaced them to such a degree that the Commonwealth government’s first Year Book in 1908 observed that “but few of the main roads in Australia have the importance which they at one time possessed”. Road transport remained in the shadow of railways until the 1930s, and in the nineteenth century its costs had made it unsuited for conveying a high volume cargo beyond local traffic. River transport, although unable to compete with railways on speed, might have been well placed to carry wool if only Australian rivers flowed strong, deep, and directly to sea. Instead they possessed numerous hazards such as bends, shallows, and fallen trees, and seasonal declines in the water level that often rendered them unnavigable. During the Drought, river

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46 Year Book Australia 1908, 541.
47 Butlin, Australian Economic Development, 312.
transport ceased for long periods because of insufficient navigable water. Tierney et al. conclude that long stretches of rivers in drought-affected areas became virtually barren.\textsuperscript{48} Finally, rail often provided the best option through difficult terrain, especially across the Great Dividing Range.

Government railways were built to serve the public interest, not to return profits. Lionel Frost emphasises two qualities distinctive to the performance of Australian railways: networks were rarely utilised to full capacity—traffic fluctuated seasonally—and financial surpluses from good years were redistributed via reduced rates to assist farmers.\textsuperscript{49} Railways were designed to reduce the transport costs of existing producers located inland and to encourage population growth and heightened production.\textsuperscript{50} Whether or not the policy was sound, it framed both the growth of the network in existence at the time of the Drought, and railway behaviour during the crisis.

“The permanent settlement of a considerable and industrious population on the lands,” wrote John Woods, commissioner of Victoria’s railways, in 1879, “can only be secured by including the centres of production in the Railway systems, and connecting them with the principal markets of the colony.”\textsuperscript{51} NSW’s commissioners outlined a similar policy “of not attempting to make high interest returns upon the capital invested upon the railways, but to assist in developing the trade of the Colony by giving as low rates as possible consistent with paying the interest cost on the capital invested”.\textsuperscript{52} An important component of this strategy was cross-subsidisation between lines. Branch lines would generate traffic for the trunk network.

\textsuperscript{48} Tierney et al., “Three Raindrops”: 9.
\textsuperscript{50} Frost, ‘Across the Great Divide’, 67–68.
\textsuperscript{51} \textit{Victoria Parliamentary Papers (VPP)} 1878 no. 6, 11.
\textsuperscript{52} \textit{New South Wales Parliamentary Papers (NSWPP)} 1896, annual railway report, 5.
success of a branch line by its sectional earnings only”. Further, any surplus from the railways should be expended on network growth and reductions in rates rather than taken as profit.

The continuation of developmental policies meant that state railway networks did not reach their greatest density until the early decades of the twentieth century. Much of the wool trade, however, made its way to port via rail in the 1890s. Railways provided speed and regularity, and the Drought affected them less than other forms of transport. Locomotives required water, but they could carry extra supplies (albeit sometimes at high cost), while rivers dried up and land-based carriers struggled to feed their animals. NSW, Queensland, and Victoria in 1890 all possessed extensive networks that pushed deep into pastoral areas. Inland terminals included Barcaldine, Charleville, and Hughenden in Queensland, Bourke and Narrabri in NSW, and Hamilton and Swan Hill in Victoria. Further expansion meant that, come Federation, terminals included Cobar, Condolbin, and Moree in NSW and Cunnamulla, Longreach, and Winton in Queensland, while in Victoria seven separate lines, six of them parallel, had been pushed deep into the Mallee and Wimmera.

TABLES 1 AND 2 HERE

The density of railways in NSW and Queensland, and the share of stations handling traffic associated with pastoralism are indicated in Tables 1 and 2. Victoria published scantier figures—it only indicated stations that handled livestock, with no breakdown by animal, and stations that handled goods, collapsing wool together with all other commodities. But in 1900 it operated 782 stations across 3,218 miles of railway, a station every 4.12 miles. Victoria’s

53 Queensland Parliamentary Papers (QPP) 1896 no.75, 10. See also QPP 1895 no.64, 8.
54 QPP 1904 no.66, 12.
55 Raby, ‘Tyrant’s Wrath’; André Brett, “‘The Exceptional Circumstances Under Which We Are Working”: Railways and Water in Australasia, 1870s to 1914”, History Australia, in press.
56 Even after 1904, when Victoria began publishing statewide revenue and tonnages for numerous commodities (with tonnage figures reported back to 1901), it did not provide a breakdown at station level.
compactness and denser population justified closer stations than NSW. Closely-spaced stations in Queensland likewise suited its developmental policy and provided convenience even for sparse populations. NSW was more frugal in its provision of stations, but more than half of them handled wool during the Drought, most despatching thousands of bales annually.

The geographic angle suggests that railways served large expanses of pastoral country during the Drought; even more illuminating are the quantities transported. In 1889/90, prior to the Drought, the 165 railway stations handling wool in NSW shipped 503,000 bales, which constituted about half of the colony’s production. Unsurprisingly, the wool carried by rail declined with its reduced production in the Drought years and the fall was greatest from those inland areas most drought-affected. Thus, in Victoria, the largest percentage falls came from inland border areas such as Moama and Corowa. These were longer hauls, which implies major railway revenue losses although tapered freight rates reduced unit charges with the increased distance carried. In NSW, for example, the wool rate from Bourke in 1894 was £4.0.3 per ton, only slightly more than the £3.16.0 charged from Nyngan, 203km closer to Sydney. Competition for border trade motivated tapered scales, and competition intensified as wool cargoes dropped during the Drought. In addition, representatives of local producers in the form of powerful woolbroking associations applied pressure for lower rates. In 1897 the Melbourne Woolbrokers Association proposed going further by ‘us[ing] its influence to obtain lower railway freights from Riverina, and if found necessary to reimburse the Railway Department a portion of the loss incurred’.

To secure wool from border regions, it was not uncommon to charge rates lower than those published, a subject of dispute at inter-colonial

57 NSW produced about 280m lbs of wool in 1889/90. With an average bale size of approximately 300 lbs, rail carriage equates to 151m lb. Statistical Handbook, 21, 42.
58 Australasian Pastoralists’ Review, 15 November 1897, 487.
59 NSWPP 1894, annual railway report, 6–7.
60 University of Melbourne Archives 1979.0178, Melbourne Woolbrokers Association, trade committee minutes 11/12/97.
railway conferences. This practice was distinctive for the wool industry: the published rates were levied for other commodities.61

FIGURE 1 HERE

Information provided in the annual reports of the colonial railways indicates their reliance on wool and how this fluctuated during the Drought. As we saw above, NSW and Queensland were the states affected most by declining sheep populations and wool production. The tonnages of wool carried by these two colonies fell by nearly a half during the Drought (see Figure 1); Victoria did not publish wool tonnages for the 1890s, but there is also a pronounced dip relative to the rest of the 1900s. There is a brief increase in 1900/01–1901/02 in NSW, for some regions enjoyed good rains in 1900.62 But then came the crash in 1902/03, and in all three states the enduring effects are clear in that the worst year for wool tonnages was 1903/04.

FIGURE 2

More telling from the railways’ perspective was the steady decline in wool’s share of overall tonnage (Figure 2). NSW carried about 12,000 tons less wool in 1902/03 than it did in 1889/90, but in that time its network had expanded by almost 1,000 miles and total goods tonnage rose from 3.8m tons to 6.6m. In all three states, the decline of such a valuable commodity must have felt inexorable to railway management.

5. The Movement of Livestock

61 Minutes of 1899 railway commissioners’ conference (Brisbane), State Records of South Australia GRS/208 unit 1.
62 Foley, Droughts in Australia, 60.
While the transport of wool fell sharply during the Drought, livestock movements rose appreciably. Several aspects of sheep farming and the effects of drought explain this. Earlier we described the Drought’s considerable geographic and temporal variations. This motivated two forms of behaviour that required livestock movement. First, livestock were moved for agistment from drought-affected areas to those with good rainfall before returning to their place of origin later in the year. Rail presented an important transport option as stock routes lacked roadside pasture and sheep were often too weak to drove. Second, the fluctuating rainfall between years encouraged the form of destocking and restocking policies discussed above. In drought years, this involved transporting sheep to livestock auctions, to slaughterhouses for boiling down, or, increasingly, to supply freezing works. In wetter years, restocking encouraged further transport by farmers seeking to buy livestock to increase their wool production and by breeders keen to send livestock to auctions to exploit rising prices.

Tables 1 and 2 indicate how many railway stations handled livestock in NSW and Queensland. They vary from suburban and peri-urban stations despatching a few horses or cows through to those whose main traffic comprised livestock. Despite the higher numbers of stations handling all livestock compared with only sheep, in both states sheep comprised 90–95% of livestock carried. As the Drought progressed, the number and proportion of stations handling sheep increased. Queensland’s breakdown by division is illuminating: the great movement of sheep on the pastoral Central Division grew the proportion of stations from 22.1% in 1894/95 to 26.9% in 1899/1900 and 30.5% in 1902/03. Victoria’s scantier statistics reveal 418 stations (53.5%) handling livestock in 1900. The numbers of livestock are immense on all three networks. For example, on NSW’s Werris Creek–Moree railway, four stations loaded between 85,000 and 125,000 sheep each in 1899/1900, with another four contributing a combined
85,000, for a total of more than 500,000 head from one branch line.\textsuperscript{63} This was heavy traffic, but not anomalous: almost every station that trafficked in sheep despatched thousands or tens of thousands annually. Butlin implies that most sheep carried by rail were driven to railheads from locations further inland.\textsuperscript{64} Many were, but it is not the case that the majority were loaded at far-flung termini.

The absence of rainfall, therefore, contributed to a major increase in trains carrying live animals and railways aided the pastoral sector’s resilience. Alan Olmstead and Paul Rhode have taken up this theme with another vehicular technology, tractors in the US. Tractors displaced horses and thereby released tens of millions of hectares of land for uses other than grazing or growing feed.\textsuperscript{65} In Australia, the outcomes were not dissimilar. Railways reduced the risk pastoralists faced from drought conditions, and in mitigating this risk they enabled land use variation—sheep could move to well-watered districts where they were not usually stocked in large numbers. Goldsborough Mort’s 1901 review confirmed the importance of transporting sheep for agistment to the Eastern Division of NSW:

“This rarely suffers from drought and consequently has been the means of saving many thousands of valuable sheep during the past years of famine. It is full of sheep from the less favoured districts many of which, in consequence of the stock routes being closed, have had to be railed there.”\textsuperscript{66}

The variability of drought conditions meant that transfers could be relatively localised. The number of livestock moved in 1896 between Narrandera and Hay, a distance of barely 100 miles, amounted to 908,000 contrasted to 180,500 for the previous year, and the formerly

\textsuperscript{63} NSWPP 1900, annual railway report, 27.
\textsuperscript{64} Butlin, \textit{Australian Economic Development}, 401–03.
\textsuperscript{66} Pastoralists’ Review, 15 March 1902, 2 (supplement).
unprofitable line from Junee to Hay suddenly became highly profitable. In South Australia, railways commissioner Alan Pendleton reported in 1897 that 138,854 sheep were carried to districts in the state’s south and far north where summer rains had fallen. This involved the running of over 90,000 additional engine miles on special trains.

The effects of soaring traffic are pronounced in Figure 1: in 1892/93, NSW carried 150,115 tons of livestock, while a decade later it reached what was then an all-time peak of 282,058 tons. Victoria, likewise, surpassed all records in 1902/03, with 377,170 tons of livestock; a decade earlier, it carried 116,258. The much-diminished population of sheep, and reduction in their average weight, makes these figures even more remarkable.

Figure 2 shows that the rise in livestock traffic was proportionally more significant for Victoria than NSW. Victoria’s railways did not carry the same quantity of minerals as its northern counterpart. So, although their livestock tonnages were not dissimilar, livestock typically contributed over 6% of Victoria’s total tonnage—and peaked above 12% in 1902/03—while in NSW livestock did not contribute over 5% of total tonnage until 1909/10 as more stock were railed to freezing works for the meat trade. Queensland published livestock numbers, not tonnage, so direct comparison is impossible, but these numbers soar from 883,000 sheep, less than 5% in the state, to 2.8m in 1899/1900, representing a rail journey for one in five sheep. From that year to 1902/03, the proportion of sheep in Queensland conveyed by train ranged between 14–24% before falling back to around 6% after the Drought.

The railways facilitated this trade by various means. Each colony provided much reduced freight rates, ‘starvation rates’, to move livestock to districts with feed and water. NSW gave a 50% reduction for the forward journey and 75% for the return. Queensland had already

67 NSWPP 1896, annual railway report 8–9.
68 South Australia Parliamentary Papers (SAPP) 1897 no.47, 4.
69 NSWPP 1898, annual railway report, 4, 59.
introduced new tariffs in 1894 in the expectation that reductions would have a tonic effect on freight volumes “unless something unforeseen happens, such as a protracted drought”.70 It had to make even deeper cuts and management might have wished for foresight. As rates were discounted further, fears emerged that these served as a temptation to farmers who wished to move healthy stock speculatively. George Prendergast, a Victorian parliamentarian who would later serve as a Labor premier, was so agitated by reports of abuse of the starvation rates that he proposed a parliamentary inquiry. In debate two interwoven issues emerged. First, the Railways Department was investigating a few instances where stock had been declared as starving when they were not. Second, the “abuse” of which Prendergast complained was that the reduced rate applied if stock were starving regardless of the consignor’s financial position—an unfair advantage for wealthy landowners in the view of labour men, but not fraudulent.71

With insufficient specialised rollingstock to carry the increased livestock, the railways deployed general goods wagons that could only carry sheep to the equivalent of about half a normal load. Therefore, the respective rollingstock departments went to the expense of converting some wagons into more efficient carriers. More specifically, they refashioned cattle wagons into sheep vans “for the purpose of removing starving sheep”.72 Where livestock were too weak to transport or the pastoralist preferred to bring in fodder, this was also railed at much reduced rates. For some pastoralists, such as the Falkiner family of the Riverina, fodder was the greatest expense during the Drought and proximity to railway delivery was essential.73 Only NSW published data for hay, straw and chaff, and in Table 1 it is noteworthy as the one pastoral-related commodity to experience a large increase in the proportion of railway stations receiving

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70 QPP 1895 no.64, 12.
72 QPP 1900 no.65, 79; VPP 1902 second session no.10, 96–98.
73 Jones, Slow Catastrophes, 130.
it – from 59 to 80 percent between 1894/95 and 1902/03. The vastness of the quantity of fodder is captured in Figure 1, where its tonnage quickly doubles.

6. The Financial Performance of the Railways

The consequences of the Drought are evident from the railway accounts. Figure 3 shows that freight revenue from wool collapsed by half in NSW and Queensland, while Figure 4 reveals that wool’s share of total railway freight revenue fell even more sharply – in NSW from 21 to 9 percent 1894/95–1903/04 and in Queensland from 18 to 8 percent. The effect on revenue can perhaps be illustrated best by the fall in revenue per mile for wool carried in NSW, from 23.7 shillings in 1894/95 to an all-time low of 6.7 shillings in 1902/03. Queensland experienced a similar decline: figures for wet years before 1897/98 were not reported, but 1902/03 again is the nadir, 4.45 shillings per mile, which more than doubles by 1909/10.

Figures 3 and 4 here

Increased livestock traffic only partially offset this declining wool revenue. Livestock’s share of Victorian rail tonnage trebled from 4 to 12 percent 1894/95–1902/03, but its share of revenue rose only from 9 to 16 percent, reflecting the subsidies provided. In NSW, livestock tonnages nearly doubled in the same period, but share of revenue actually declined from 18.3% to 15.2% in 1900/01 before climbing to 19.2% in 1902/03. Queensland, as noted, published sheep numbers not tonnage; in 1895/96, 1.2m sheep were carried furnishing 17.5% of revenue; in 1899/1900, 2.8m were carried, much higher than any other year before World War One, but the discounts meant livestock contributed only 17.4% of revenue. In NSW, fodder’s share of revenue rose from 1 to 3 percent 1899/1900–1901/02. When steep discounts were made at the height of the Drought in 1902/03, its revenue share collapsed to 0.6%, despite contributing
over 4% of the annual tonnage—more than double its usual volume. The increased traffic in these commodities was clearly not remunerative.

The Drought, therefore, adversely affected the railways’ financial performance, a fact detailed regularly in their annual reports. In the mid-1890s, after a series of generally good seasons and the extension of railway networks deeper into the interior, commissioners anticipated increases in pastoral freights. These forecasts would not be met. NSW’s commissioners concluded in 1895/96: “The serious drought which afflicted New South Wales… caus[ed a] heavy decrease in wool and other traffic”.74 Things were no happier in Queensland where “the receipts from the wool traffic generally show a decided shrinkage” in 1895/96,75 attributing an annual loss of £200,000 to the Drought in 1900/01.76 The NSW commissioners’ summary for 1902/03 holds for all three colonies: “Owing entirely to successive years of unprecedented drought, which may be said to have reached its most acute stage about twelve months ago, the year … has been, financially, the most disastrous in the history of the railways of the State.”77

Several reasons may explain why the railways went to the expense of facilitating the livestock trade. A small amount of revenue was preferable to the obsolescence effects of labour and capital lying idle. Railway departments, like stock and station agents, were prominent institutions in rural society with large capital investments and employment that kept local economies moving.78 In addition, they would have been acutely aware of the close association between their long-term fortunes and those of the pastoral sector. Relatedly, the railways’ evolution as state institutions was to provide transport for regional economies beyond the few routes where population density and capital would have sustained private railway companies.

74 NSWPP 1896, annual railway report, 2.
75 QPP 1896 no.75, 7.
76 QPP 1901 no.73, 6.
77 NSWPP 1903, annual railway report, 2.
One Victorian parliamentarian observed: “It was in the future interests of the State, and was necessary on behalf of the people, that they should save as much stock as possible”. Thomas Bent, Minister for Railways, added: the railways “sympathized [sic] most strongly with the people who were in distress”, though its sympathy was unlikely to extend to free conveyance as “the railway men had to be paid”. Discounted rates balanced the competing demands to support Victoria’s population without imposing too greatly upon the state treasury.

Similarly, the 1900 NSW railways statement tied the fortunes of the wool trade to railways:

“The concessions given were of incalculable benefit to pastoralists and the country generally, as being the means of saving th[e] lives of an immense quantity of stock which, but for the assistance afforded, would probably have perished, and although considerable increase to the expenditure has been thereby entailed, the course followed will in the future prove of advantage to the railways.”

Queensland commissioner Gray reflected upon large reductions in freight charges and concluded: “Although this may appear to be unwarranted, it has had the effect of saving thousands of sheep which otherwise would have been lost to the state”. South Australia’s Pendleton put the matter most simply: he “fully recognis[ed] the national interests at stake, as also the direct importance to the Railway Department of saving the lives of the graziers’ and farmers’ cattle, sheep, and working horses”. In a time of crisis, state railways were expected, within reason, to forego revenue for the public good.

The effects on the railways were compounded by the Drought’s negative impact on the wheat, sugar, and fruit industries, and the decline in drought-affected communities’ demands for

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80 *NSWPP* 1900, annual railway report, 3.
81 *QPP* 1901 no.73, 8.
82 *SAPP* 1897 no.47, 4.
leisure travel or general merchandise. In NSW, 1902/03 had the lowest revenue per train mile since its railways opened, 5.75 shillings. Even during the Drought years in the later 1890s this figure had hovered around 7.5 shillings. In Victoria, the effects of the Drought in the 1890s were stronger, with revenue per train mile already below 6 shillings, where it remained until the better season of 1903/04. This figure was ordinarily above 7 shillings outside 1889/90–1902/03.

7. Longer-term effects of drought policies

Our focus has been the role of the government railways in the immediate short-term response to the Drought. It seems likely that there were also long-term consequences, some unintended and others learning effects. While sheep numbers collapsed during the Drought, they recovered most of these losses within a decade. Along with improved on-farm pasture management, the mass movement of livestock during droughts continued in subsequent low rainfall years and provided a form of future-proofing to assist the industry through crises. The success of railways in facilitating agistment during the Drought meant extensive subsidies were implemented in subsequent dry seasons—though in South Australia, a deferred payment scheme contributed to decades of financial losses.  

Countless decisions would have been made throughout the Drought about which livestock to save through agistment and which to slaughter. The protection of the fittest and the slaughter of the others helped the rapid recovery in numbers and revitalisation of what had been an ageing sheep population. In turn, ‘fitness’ decisions made by financial institutions with regards to pastoral properties cleared out many businesses that were run poorly or located in marginal inland areas. The lenders themselves were also forced

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83 Heathcote, ‘Drought in Australia’: 185; Jones, Slow Catastrophes, 253.
84 Boot, ‘Debts, Drought and Foreclosure’: 42.
to rethink the wisdom of their own strategies aimed at supporting pastoral expansion, particularly onto marginal land, funded through risky strategies of lending long and borrowing short.\textsuperscript{85}

Three major changes in the Australian pastoral industry were occurring at the time of the Drought that would become permanent features. These were the frozen meat trade, the wool market’s relocation, and the rise of mixed farming.

The railways were acutely aware of the growing export trade in frozen meat as a source of revenue. From initial experiments with the technology for chilled exports in the early 1880s, the trade’s growth was slow for the rest of that decade. By the 1890s, however, it was expanding rapidly with the development of freezing works and oceangoing vessels fitted with refrigeration equipment, which defied the extreme heat and long haul logistics from the Australian farm to the British dining table.\textsuperscript{86} Even small merino sheep, ripe for destocking during the Drought, were worth more as frozen meat than tallow or local meat sale.\textsuperscript{87} Victoria’s frozen mutton exports rose from 5m lbs in 1893 to 19m by 1896 and 23m by 1899,\textsuperscript{88} with Australia’s share of the main market, Britain, also rising.\textsuperscript{89} The railways identified this trade as “unquestionably of a permanent character” and, under lobbying pressure from stock and station agents and the frozen meat trade, it was one of the main reasons the railways invested for the longer term in specialist livestock wagons.\textsuperscript{90}

\textsuperscript{85} Ville, \textit{Rural Entrepreneurs}, 86–91.


\textsuperscript{87} Edward Shann, \textit{An Economic History of Australia} (Cambridge: University Press, 1930), 342.


\textsuperscript{90} \textit{VPP} 1902 second session no.10, 97.
In the early years of wool exports, the clip was mostly consigned for sale at London auctions. From the late nineteenth century, the point of sale shifted to Australian auctions prior to shipment. Several reasons explain this, but it was particularly associated with the geographical diversification of buyers away from British domination. Continental European buyers began setting up offices in Australia in the 1890s, buying wool at auction and shipping it to Europe. It was during the Drought decade that the share of wool exports sold locally accelerated, doubling its share of the market. The shift was most noticeable in Sydney where the Continental European share of wool sales had risen to 79 percent by 1899/1900. It has been suggested that the reason for this change in demand was that the poor quality of Drought-era wool discouraged quality-focussed British buyers. The *Australian Pastoralists Review* had already noted in November 1897: “the great bulk of the wool now reaching Sydney shows the effects of the drought very plainly and is only suited for the Continental trade, for which it is mainly being purchased”.92

The Drought shaped longer-term patterns of technological adoption and land use. Michael Quinn has argued that many lessons about the need to reconcile pastoral demands with climatic variability, although somewhat absorbed in the immediate aftermath of the Drought, were soon forgotten. Nobody would doubt that Australian rural industries continue to place steep demands on ecosystems that do not always align with climate realities. But the pastoral industry did not fall back on all its old ways after the Drought. The smaller Australian sheep flock encouraged better breeding and management to lessen the reduction in wool output. Yields rose during the Drought and continued to do so after 1903.94

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92 *Australasian Pastoralists’ Review*, 15 November 1897, 487.
reported the different effects of the Drought on wheat and sheep farming particularly between years. Sheep could often provide some income if the harvest failed because of a lack of seasonal rain. In turn, high fodder prices provided a lucrative income in generally poor rainfall seasons. The realisation that mixed farming mitigated risk doubtless encouraged the switch to these forms of operation.\textsuperscript{95}

The devastation of wool production in inland regions during the Drought, as noted above, resulted from the largest falls in sheep population. This discouraged pastoralists and financial institutions such that half a century later the sheep population in the Western Division of NSW remained well below its pre-Drought peak, even as numbers were growing rapidly elsewhere.\textsuperscript{96} More realistic stocking levels, along with technologies and mixed farming practices designed to mitigate the effects of drought in low rainfall areas, facilitated resettlement in the longer term.

8. Conclusion

The Federation Drought reveals vividly that railway technology is not beyond nature, nor simply an industry that imposes itself upon environments. Rather, climate and weather modified the daily operation of railways and prompted adjustment in policy and practice on both short and long timescales. State railways were an essential part of the fabric of Australian rural society and economy by the end of the nineteenth century, which provided governments with the tools to ameliorate the worst effects of extreme climate events. The adverse consequences of the Drought on alternative forms of transport – stock routes and rivers – and extensive rail coverage of pastoral districts by the 1890s made railways central to state assistance.


\textsuperscript{96} Butlin, \textit{Australian Economic Development}, 66.
to the industry. Politicians, pastoralists, and railway administrators alike viewed railway policy as essential to the Drought response. Steep freight subsidies facilitated the movement of many thousands of sheep for agistment from drought-affected areas to coastal pastures, along with the shipment of fodder in the reverse direction. These subsidies meant that the increased tonnages of some commodities did not come close to offsetting falling revenue from others. The willingness of government railways to bear significant losses reflected several motives, such as their social capital stocks in local communities and a desire to keep labour and capital employed. Ultimately, though, the railways, as government organisations, had a broader mission than the short-term health of their balance sheets.

It is difficult to estimate precisely the benefits of state enterprise policies for the wool industry. While the sheep flock and wool production both fell sharply, their rapid recovery within a few years of the Drought’s end is noteworthy as are some of the longer-term benefits that relate, at least in part, to Drought-era responses such as better agistment methods, more diverse markets, and the growth of refrigeration. It may well be, therefore, that government capital outlays offered benefits to private activity in Australia’s largest export industry in both the short and long run.

The provision of financial support to farmers during droughts has remained contested into the twenty-first century. While some observers view droughts as a form of natural disaster deserving of state support, others see them as part of the normal cycle of rural industries for which farmers should plan. This returns us to the relationship between the central ideas of vulnerability and resilience raised at the beginning of the paper and how transport technology affects the interdependence of humans, the animals from whom they obtain economic gain, and the broader environment. Vulnerability occurs in communities that are exposed to the effects of natural extremes such as drought or flooding. Responses to such disasters can provide short-
term emergency relief. However, it is the development of resilience—planning for an expected reoccurrence—that can assuage future vulnerabilities and alter the longer-term effects of disasters. Resilience can be embedded in the collective behaviours of a community, such as its stocks of social capital, and also through the strategies of key economic actors within those communities, of which the state railways was a main player at the time of the Drought.

Debates continue to range over the type and effectiveness of policies. The modern provision of structural readjustment finance, in addition to short term assistance, recognises that droughts can be pivotal phases shifting the type and location of farming over time. Had it existed a century ago, this support may have accelerated the closure of heavily indebted and unproductive farms in inland regions of NSW and Victoria. Transport subsidies of up to 50 percent continue to be offered today, although often indirectly through private road hauliers, leaving farmers exposed to freight rate increases. Levels of funding for road and rail transport remain hotly contested, as does public or private railway ownership. What is clear from the Federation Drought, however, is that government ownership of railways facilitated consistent and targeted responses to hardship in rural industries. The policy responses and operational practices—from discounted rates to emergency trains and improvised rollingstock—underscore that the economic role of railways is also environmental: climate extremes prompted new or modified uses of rail technology. In sum, the Drought embedded railways even further in the fabric of rural life and land use throughout Australia.
