Empire and Environmental Anxiety

Health, Science, Art and Conservation in South Asia and Australasia, 1800–1920

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in the expanding government medical services, Scottish-trained medic's role in forest conservation declined. This was accentuated by increasing professionalism – exhibited by the sending of officers for a period of forest training on the continent, the establishment of a national pay scale and a professional journal – that drew boundaries between those trained in forestry and those who were not. By the late nineteenth century, too, medical specialisation, an increase in non-Scottish-trained doctors and a series of disease outbreaks kept all doctors, Scottish-trained ones included, busy pursuing medical interests. In contrast, the different levels of acceptance of government action in settler societies limited the environmental anxieties of New Zealand's Scottish-trained doctors, while in Victoria no Scottish-trained medicos appear to have articulated environmental anxieties.

Environmental anxieties among Scottish-educated doctors were neither as vocal nor as widespread in New Zealand as they were in India, while in colonial Victoria they were seemingly non-existent. In both Victoria and New Zealand, Scottish-trained doctors pursued natural history as a means of colonial development while of the two colonies only in New Zealand did this group express environmental concerns. These colonies' later development, combined with perceptions of the relatively inexhaustible supply of their timber, meant that environmental anxieties were not as patent as in India. Moreover, the emphasis on laissez-faire government further restricted the effectiveness of Scottish-trained doctors in developing state responses to environmental anxiety in New Zealand. Neither Victoria nor New Zealand ever had an equivalent to the IMS to provide practitioners with state positions and from which a lobby for state forest bureaucracy could emerge. By the 1880s, when environmental anxieties gathered pace in Australasia, greater opportunities for doctors to practise in their own fields, combined with specialisation, and the rise of other models (notably from India), further lessened the opportunity for Scottish-trained doctors to express environmental anxieties. The next chapter examines in greater detail the development of state forestry in India and Australasia in relation to the influence of German scientists and German models of state forestry.  

5

German Science and Imperial Forestry, 1840s–1900s

My experience of all these Germans is ... that they must be kept in their place. Their good education & general knowledge rapidly gets them good scientific posts to begin with - this demoralizes them, & after a few years they resent everything, & try to override everyone.¹

J. D. Hooker, 1879

Good God! Are these [German] authors such Oracles that we must translate every syllable and render letter for letter, lest we lose a drop of their saliva, or a whiff of their flatulence?²

Hooker, 1854

This chapter examines the environmental anxieties and bureaucratic responses initiated in Australasia and South Asia by German-trained scientists, whose prominence and qualifications J. D. Hooker had mocked. In India, German-trained scientists effectively developed the foundation of state forest conservation laid by Scottish-trained doctors, moving it onto a far more professional footing. Their strong educational background and particular experiences and training gave German-educated scientists a system, and a science, to translate these earlier anxieties into practical policies and bureaucratic solutions, moderated by the particular political and environmental circumstances of colonies.³ Thanks to greater acceptance of state intervention, German scientists developed the IPS into a widely admired bureaucracy, whereas laissez-faire attitudes restricted their impact on state forest management in Australasia. In both regions, however, environmental anxieties proved
crucial in fostering a sense of alarm and in establishing the professionalism of foresters.

This chapter first examines the particular educational, social and political factors that characterised German education and which meant they approached environmental problems in much the same manner across the Empire. A shared and strong scientific training, it shows, led to their prominence throughout the British Empire. Next, the chapter investigates in greater detail the relationship between education, environmental anxiety and bureaucratic expansion as well as the particular geographical circumstances and political systems that gave rise to local differences of forest administration and conservation across India and Australasia. It argues that, in the development of a scientific cadre of professional foresters, environmental anxiety served useful ideological needs, especially given the conflict between advocates of forestry and agriculture (such as between the IFS and the Revenue Department in India), a resolution which worked in forestry’s favour in India more than in Australasia. As this chapter shows, Indian environmental anxieties and forestry models continually responded to German and French forestry ideas, geared to local needs, at the same time as increasing local evidence of environmental problems emerged. In discussing the role of German-, and to a lesser extent, continental-trained scientists in articulating and developing the profession of forestry through environmental anxieties, I deliberately use the term ‘German-trained scientists’, rather than ‘German science’, in recognition that local circumstances dictated the adaptation, rather than wholesale importation, of German methods.

This chapter provides an important comparative dimension to historiography on the development of forestry, by stressing the importance of local environmental and political factors in moderating the similar anxieties of German-trained scientists in different places. It also supports the work of Ravi Rajan by providing a series of detailed case-studies illustrating the on-going importance of continental forestry traditions in areas not examined in detail by Rajan. As well, it demonstrates the variety of forest policies within India’s seemingly national forestry legislation, a point often forgotten, and which further underlines the need to understand local-level exchanges of environmental anxieties and responses.4

German education

In examining the success of German-trained scientists in the British Empire, it is illustrative to closely interrogate Hooker’s comments quoted at the beginning of the chapter. As Hooker hinted, the key to understanding the German university system and indeed its social system, especially from the second half of the nineteenth century, was Wissenschaft. Put simply, rather than meaning science in any narrow sense, Wissenschaft referred to the application of professionalised and ‘scientized’ behaviour to the pursuit of knowledge.6 Through the ideals of Wissenschaft, universities in the German-speaking lands became indispensable certifying agents for membership in the Bildungsbürgertum, the intellectual, professional, and administrative bourgeois elite that predated and then developed parallel to a large commercial middle-class.7 In lieu of political freedom, authorities instead expected the growing middle-classes to pursue intellectual goals in return for employment in the expanding state bureaucracies.8 While the policy of minimising dissent through offering intellectual rather than political freedom did not prove wholly successful, the spread of the ideals of Wissenschaft did. Desire for moral and intellectual improvement – or ‘cultivation’ – found widespread popular expression in the German term Bildung and in the desire for this by large sections of society.9

By the mid-nineteenth century, scientific professionalisation was gathering momentum in the German lands thanks to the strength of regional universities. Growth, however, belied the crisis many had earlier faced under alternating periods of political reaction and reform.10 And it belied a broader tension between practical and theoretical education. Scholars have discerned that practical and applied sciences took hold in the German lands from the late-eighteenth century as states introduced aspects of the newly discovered ‘sciences of government’ (Kameraltwissenschaften or the cameral sciences) to a wide variety of areas, from administration, surveying and tax collection to agriculture, forestry, and even the mapping of disease. University education – indeed, so too the ideals of Bildung – also drew a line between moral and intellectual self-cultivation and practical and utilitarian needs.11 Though tensions between practical and theoretical education would remain, a working solution, largely instituted by the mid-nineteenth century, registered a compromise between the ideas of education and the specific technical expertise required by the German states. The solution involved extensive borrowing from French models of technical education, as pursued through the Écoles Polytechniques – military academies established by the state to provide it with engineers, surveyors and other practical services. From 1819 to 1866, German states founded several of these institutes of technology (technische Hochschulen). This formed part of the evolving German education system, which catered to different state
requirements. By the mid-nineteenth century, students could choose between Oberrealschulen (higher vocational schools, allowing pupils entry to technische Hochschulen), Gymnasien (grammar schools, teaching Latin and Greek, from which pupils advanced to university) and Realgymnasien (something of a compromise between the two previous options, where students learnt modern languages, and from which they could enter certified professional studies). Despite such divisions, as Lewis Pyenson and Susan Sheets-Pyenson note, 'the battery of examinations instituted to certify young men as customs agents, mine inspectors, and Gymnasium teachers went far beyond the practical knowledge necessary for the jobs'.

One of the most significant educational reforms in terms of the British Empire that took place in the German lands involved the establishment of Forstwissenschaft (forestry science). This discipline appeared, in part, in response to the devastation of the Seven Years' War (1756–63) and the resulting realisation of major timber shortfalls. As a solution, administrators in the different states and principalities of the 'German' lands turned to the principles of Kameratwissenschaften, applying scientific methods to forest management. By the early 1800s, Forstwissenschaft demanded the application of systematic mathematical modelling and surveying to the sustainable harvesting and growth of forests. Buttressed by an impressive array of technical treatises and a battery of examinations, in response to local needs, several forest academies promulgated and developed the discipline, in turn furthering its professionalisation. While forest conservancy expressed regional differences in forests and approaches, most British writers referred to 'German', rather than acknowledge forestry's regional diversity across the German-speaking lands. Forestry education developed rapidly in the nineteenth century, becoming part of the wider educational reforms instituted by states. In the 1820s, a handful of forest institutions were attached to universities: in 1821, for instance, the Forestry College at Eberswalde became part of the University of Berlin. Others emerged around this period, commonly as royal academies. Forestry science as a profession also developed in the Austro-Hungarian Empire, motivated by long-standing problems of deforestation and flooding on its higher lands. Later still, it spread to other parts of northern Europe and France.

If the German-speaking regions as well as those of northern Europe and France exhibited a sophisticated understanding of forest systems supported by a professional cadre of foresters, across the English Channel a strong tradition of forestry simply did not exist. What eventually developed from the late-nineteenth century, owed much to continental and Indian models. Even Scottish plantation forestry appeared relatively unscientific and unsophisticated when set against continental systems of forest management. German forestry provided a model in the 1820s for France and later, for India, Australasia (via India and France), and finally England and Scotland (through the British Empire and continental forestry). German models, themselves reflective of regional differences, were adapted to local imperial needs. German forestry methods in India, New Zealand and Australia required considerable adaptation to manage hitherto unknown forest types growing at different speeds and in different climates and terrain. However, as Dietrich Brandis, India's first Inspector-General of Forests, argued, while the 'Climate and the species of trees are different in India' from Europe, 'the principles upon which systematic forestry is based, are the same in all countries'. They rest, he declared, 'upon the results which long experience has furnished in those countries of Europe where scientific forestry is oldest and best understood'.

Based on a complex system of mathematical equations and detailed surveying techniques, the principles of German scientific forestry as eventually applied to India appeared to eschew sentiment and diversity for profit and conformity. Yet this was actually far from the case. German forestry under the principles of the cameral sciences developed a strong moral element. Foresters argued that systematic management represented responsible government, an argument that gained particular ground in India through utilitarianism. But it also went further than that. German romantic sciences emphasised the perceived harmony between nature and the self, the individual and the organic. Early expression of this view appeared in the work of geographer Alexander von Humboldt. A true polymath, Humboldt viewed aesthetics and science as complementary ways of comprehending nature. Nature, Humboldt believed, comprised an organised whole fully deserving of investigation in its totality. Fired by such views, Humboldt expressed considerable anxieties about human environmental impacts. His widely read Personal Narrative of a Journey to the Equinoctial Regions of the New Continent, recounting its author's adventures in South America, argued that deforestation diminished rainfall and dried-up streams, reducing the size of Venezuela's Lake Valencia. Others (see below) – German and non-German alike – supported their environmental anxieties in the British Empire with reference to Humboldt's works, while Humboldt himself even inspired a few to undertake imperial scientific exploration.

Plant geography, itself pioneered by Humboldt, is an example of the influence of German romanticism on scientific study, which later
contributed to the development of ecology. In the early-nineteenth century, plant geographers valued the accurate research of complex interactions between different phenomena, an approach that made many trained in this tradition acutely aware of environmental change and its consequences. A measure of their importance is that German-trained botanists were keenly sought after in Britain and its empire in the nineteenth century because of the relatively underdeveloped state of the natural sciences at institutions such as Cambridge and Oxford. Indeed, Oxford and Cambridge relied on German models for the gradual reform of their scientific curricula.

Aside from demand and a strong practical training, especially in forestry and the plant sciences, local factors influenced the decision of German-trained scientists to work in the British Empire. Political and religious repression in the German lands, particularly in the 1820s to the 1840s, drove many well-educated scientists from their Heimat (homeland). Economic downturn and shrinking opportunities in German bureaucracies, coupled with an inability to gain permanent university positions, further stimulated migration. Less tangible motives also played a role. In common with many other Europeans (see Chapter 2), Australia’s perceived salubrity attracted several German migrants, perhaps most famously Ferdinand von Mueller.

Indian forestry and forestry debates

German scientists played a central role in consolidating, and then expanding, state forestry in India. Drawing from their own training and experiences, they provided a forestry management template, staffed a significant part of the IFS, and oversaw the expansion of state forestry on a national scale (though still with particular local differences). Their influence also led to increasing professionalisation. Historian Ulrike Kirchberger has observed that until recently, historians of empire have largely overlooked the importance of German foresters, a lacuna, she contends, reflecting the relatively seamless assimilation of Germans into structures of British imperialism. Although the hardly flattering comment quoted at the beginning of this chapter by J. D. Hooker suggests that assimilation may not have been as seamless as Kirchberger believes, German foresters undoubtedly played a crucial role in professionalisation, supported by their articulation of environmental anxiety in India. Kirchberger estimates that about a dozen German foresters attained high-ranking positions in the IFS, along while many others served in lower-ranking forestry positions. As well, German-trained scientists found employment in the IIC and later Raj bureaucracies as botanists or scientists in addition to maintaining a lively correspondence among themselves. A measure of the importance of German graduates to the IFS is that its first three permanently appointed Inspectors-General all came from German forestry or other scientific backgrounds: Dietrich Brandis (1864–81); Wilhelm Schlich (1881–4); Berthold Ribentrop (1889–1900).

Generally speaking, German foresters became influential in India from the 1860s. Their guidance played a crucial role in professionalising the IFS. They expanded its bureaucracy, increased its legitimacy by raising the standards of forestry education, established a professional journal, and not least, set the running of the IFS on firmly scientific lines. While many military served as forest officers throughout this period and after, a reminder that professionalisation took place gradually, German foresters nevertheless guided the expansion of its bureaucracy. They oversaw the development of a forestry school at Dehra Dun (northern India) in the late 1870s for the instruction of non-commissioned officers. By 1899, it had trained some 343 Forest Rangers as well as issued 105 certificates for those taking forest courses in the vernacular. From the late 1860s until the opening of the Royal Indian Engineering College at Cooper’s Hill (in England) in 1884, officers received their forestry education in Germany (until 1875) and France (from 1866). By 1884, some 79 officers of the IFS had been trained on the continent. Cooper’s Hill, opened in 1884, offered a 26-month course in forestry (later extended in duration), including a four-month placement for students. The German forester (and later Inspector-General) Wilhelm Schlich served as its first Professor and when Cooper’s Hill closed in 1905, both he and forestry education relocated to Oxford University. By 1897/1898, Cooper’s Hill had trained 104 forest officers. Aside from a thorough and professional training, the establishment of a forestry journal helped to solidify a professional identity for forestry. Earlier, Schlich served as the founding editor of the Indian Forester. This journal provided a forum for discussion of forestry matters, proselytised the forestry message and made a marked contribution to the formation of a profession.

The impact on forestry in the nineteenth century of the succession of German leaders was profound. Later foresters, for instance, acknowledged its first Inspector-General, Dietrich Brandis, as the founder of modern Indian forestry, an individual presented as dragging forestry from the early years of the medico-foresters into the professional era. Whatever the hyperbole or motivations for such praise, Brandis undoubtedly had a profound impact on the IFS. He and his successors expanded the
forest bureaucracy and attempted to re-organise it on a national basis. They also sought to consolidate previously disparate and localised forest legislation, though not always successfully. Under these reform-minded, German scientists, the forest bureaucracy expanded greatly. In 1869, for instance, there were 57 forest officers; by 1885 that had almost doubled to 107; and, by 1899, the latter figure had nearly doubled again, to 213, out of the IFS's overall staff of 10,508. The overall area of conserved forests also expanded (Table 5.1). Brandis's dynamism and vision made much of this early work possible.

Brandis studied natural science at Göttingen, Bonn, and Copenhagen, completed a Ph.D. in botany in 1848 and began work at Bonn University in 1849. Appointed by Lord Dalhousie as Superintendent of the Pegu teak forests in 1856, Brandis distinguished himself by successfully resisting the attempts of timber cutters to undermine conservation. With the territorial expansion into Lower Burma, Brandis enforced the British declaration that all teak forest was state property. That experience of forest management had a lasting impact on Brandis. He would later disclaim the 'lesson' taught by Burma's experience, that public forests should not be entrusted to private firms.

Brandis' arguments for forest protection emphasised the need to prevent an impending timber famine and associated hydrological and local climatic changes. He also stressed the revenue managed forestry could provide the state. In a series of articles published in the 1880s, Brandis outlined his forestry programme. He emphasised forestry's primary aim of ensuring future timber, but also pointed out the hydrological impacts of forestry. '[T]here is no doubt', he declared, 'that on hills clothed with forest the soil is protected, that less soil is washed away, and that less sand and silt are carried down by the rivers'. While careful to stress that not all floods could be stopped by conservation, he pointed out that 'the beneficial effect of forests is chiefly felt when the ground is hilly; and it probably is greatest in a tropical or subtropical climate, where the rain comes down in torrents and evaporation is very rapid'. Particular colonial circumstances contributed to environmental problems, he noted. In support of his contention of the importance of forest preservation for hydrological reasons, for instance, Brandis cited the local example of Ajmer, in Rajputana. Deforestation after 1850, he argued, led to sudden floods, siltation and soil erosion, problems exacerbated by drought. With reduced forest cover, Brandis pointed out, cattle fodder declined along with stock numbers, exacerbating the plight of the population during famine.
On the forests-climate question, Brandis regarded local-scale climatic influences as likely. Acknowledging the theory's widespread popularity, he pointed out that, first and foremost, 'the climate of each district depends upon its geographical position, its elevation, the configuration of the ground, and upon cosmic causes which are independent of local circumstances'. Only 'in their immediate vicinity', he concluded, could forests influence climate. To investigate that connection further, Brandis initiated a series of experiments. Noting the complexity of 'relations between forest and rainfall' in India and the influence of climate on forest distribution, he also instanced recent 'facts', which 'point to the conclusion that the conservation of forest in several localities has resulted in the increase of the mean annual rainfall'.

In emphasising such environmental problems, Brandis, realising the imprimatur of authority that science granted, took especial care to apply rigorous scientific methods to forestry. For instance, in arguing that forests influenced water supply, Brandis noted that: 'Unless these matters are proved by precise experiment, steady progress in forest conservancy, to the extent demanded by the interests of the country, can hardly be expected. The objection can always be raised, that forest conservancy has been carried too far, and that its indirect advantages are imaginary.' Later foresters, such as Inspector-General Ribbentrop, would also draw from German research into the impact of forests on hydrology and climate (see Chapter 6). One of the singular acts of Brandis' period in control culminated in 1878, with the passing of the Indian Forest Act. This act attempted to extend state forestry by more clearly defining the scope of forest rights and access as well as the status of reserved and protected forests. It also sought to remove local variations in the Indian Forest Act of 1865, which had created the first national forest department. The forest acts of Burma and Madras diverged from the 1865 Act, while as Ribbentrop noted, they also 'differ often district by district and thereby place not only the Forest Administration, but the surrounding population, in a maze of bewildermement'. Reserved status denoted forests near to towns, which could be sustanably managed. In these, foresters mostly removed local rights, either by extinguishing existing private property or by providing compensation for lands lost. Protected Forests were areas where rights to forests were recorded. Finally, the act allowed for the establishment of village forests, granting villagers access to resources.

Attempts at centralisation and the expansion of bureaucracy, as several authors have written, belied the on-going importance of locality in accounting for differences across forest conservancies and in circumscribing colonial rule and forest legislation. For instance, provides a wonderfully detailed case-study of colonial southwest Bengal to demonstrate the manner in which ecology and geography, in-fighting between District Officers and Forest Officers and resistance from local populations, thwarted the efforts of the IFS to enact forestry working plans and extend their authority. Subaltern scholars, in particular, have also demonstrated the ability of local peoples to resist the encroachment of forestry legislation, particularly after the more invasive 1878 Act. Despite the efforts of its directors, professionalisation took place gradually. As Brett Bennett observes, India's foresters 'struggled to create a coherent system of forestry' and, according to Benjamin Weil, only succeeded from the 1920s in realising Brandis' vision of a more uniformly technocratic and bureaucratic IFS. A closer examination of the 1878 legislation bears out these observations regarding professionalisation and reveals the extent to which the Act represented a step towards a more uniform legislation rather than the fulfillment of such a goal. It certainly was not a hegemonic piece of legislation, as claimed by some scholars. Remarkong on such regional developments before the 1878 legislation, Berthold Ribbentrop later observed in his overview of Forestry in British India, that although 'the [British] state had inherited extensive proprietary rights in the forests of India from the rulers by whom the territories were ceded, the actual status of the property and its extent were uncertain'. The complex political and environmental landscape of India challenged attempts at national forestry management.
to the Conservator. Administrators extended this system, in operation since 1880 in the North-West Provinces, to Burma from 1880 and Assam from 1882. Similar variations existed in other Indian provinces. Indeed, by the late-nineteenth century, local variations in control remained. All provincial conservators of forests answered to local government control, except for Madras, where the Board of Revenue intervenes; and of Berar, Coorg [sic] and Ajmer, where the business is carried on through the Commissioners.56

Local environmental and settlement differences, in terms of the trees growing there, their growth rates and the topography, climate and rainfall in which they were found, further impacted on forest policy. The Punjab and Central Provinces, for example, containing much land unfit for permanent cultivation, included within their bounds both desert and forest.57 As noted in the previous chapter, the taungya system developed uniquely in Burma, while the Land Revenue Settlement recognised state forests under the Hazara Forest Rules (see Chapter 4). In environmental terms, too, the IFS had to manage a variety of forest types, growing at different rates in different climates across varied topography. Larger bioregions in India encompass the evergreen forests located on much of its west coast in areas of relatively high rainfall, and kept moist by the southwest monsoon. In Central India, from the southern Himalayas in the Punjab almost to the far south, deciduous forests dominate. Alpine flora varies in its geographical distribution and extent. It is found in the higher altitude regions such as in parts of Afghanistan, Burma, Beluchistan and the Himalayas whereas low rainfall restricts the geographical extent and size of the forest of Rajputana and Punjab. Only small trees and bushes grow in the Thar Desert. Along coastal Bengal, mangroves dominate. In the Western Himalayas, vegetation decreases towards the interior with diminishing rainfall. On its wetter, outer ranges, sal (Shorea robusta) grows up to 3000 feet (1214 m). Higher still, from 4000 to 10000 feet (1619 to 4047 m) in height, dependent on latitude, conifers dominate. Temperate vegetation grows in the 4000 to 6000 feet (1619 to 2428 m) zone, giving way to deodar and blue pine (Pinus wallichiana) from between 6000 and 8000 feet (2428 to 3237 m). Higher still, at from 8000 to 11000 feet (3237 to 4452 m), Himalayan spruce (Picea smithiana), oak (Quercus spp.) and West Himalayan fir (Abies pindrow) dominate. Above 12,000 feet (4856 m), birch (Betula bhojpatra) and rhododendrons grow. Forest management in India – so very different from Europe – thus required particularly detailed knowledge of local environments. The reproduction of pine and mixed oak forests, as Ribbentrop observed, was much better understood than of species such as deodar. Deodar regeneration required careful observation because only certain trees bear male flowers, a particularly difficult requirement for foresters given the height and density of the forest canopy. Areas with few forests and scarce rainfall, as in parts of the Deccan, required considerably longer growth periods to regenerate species, unlike, for example, the areas of higher rainfall in the teak forests of Burma. Even then, the re-planting of teak only enjoyed success where such species were already well represented; otherwise, bamboo and other vegetation unwanted by foresters grew up.58

Local environmental problems, coupled with local political systems, accounted for the different nature of environmental anxieties and responses in India. These persisted into the twentieth century. In Madras, with over five million acres (2.02 million ha) of land irrigated by wells, tanks or rivers, forest protection assumed importance in maintaining the regular supply of water. As Ribbentrop observed in 1900: 'In the same way as the hurtful effect of deforestation on soil and drainage is chiefly felt when the ground is hilly and in a degree proportionate to its steepness, the beneficial effect of the action of forests in this respect is greatest under similar circumstances.'59 Deforestation on the Deccan plateau, for instance, caused the Godavari and Krishna rivers to sit up, while near Simla from the 1870s, it led to soil erosion and left hillsides barren and subject to freshets (flash-floods). In articulating their concerns, foresters took special care to emphasise the protection forests afforded agriculture. In Kanara, 'the once moist and cool valleys of the Srisi and Siddapur ranges', noted Ribbentrop, 'gardens were deserted soon after the hillsides had been cleared of forest growth', leading to the abandonment of spice plantations.60 By using local examples, foresters buttressed their authority by stressing the redemptive potential of tree planting, drawing on experience both of the impacts of deforestation in British times and historically. Early accounts of India such as by Fa Xian, a Buddhist scripture pilgrim and monk who visited south Asia between 399 and 414 CE, as well as archaeological evidence illustrating the existence of once-thriving villages in now-arid areas, contributed evidence for Ribbentrop's argument that India's climate had historically been wetter and less prone to present temperature extremes owing to the greater extent of forests. Forestry thus promised to restore areas to their naturally fertile state.61

From the 1860s, German foresters and scientists, then, significantly contributed to the professionalisation and expansion of state forestry in India, effectively building upon the earlier efforts of Scottish-trained medical foresters by enacting bureaucratic responses drawn from their own experiences and training in Germany. Although certainly not as
hegemonic or as linear a process as some historians have made out, forest professionalisation gradually took hold in the IFS at the same time as the extent of lands in state forestry increased. In upholding the need for state management, German foresters gathered detailed local evidence of historical and contemporary climatic and hydrological impacts of deforestation and set these alongside models from elsewhere. They applied the general principles of overseas scientific forest management to the particular needs of India's vastly different environments and polities. Anxieties and responses emphasising the role of forests as sources of revenue resulted in part from attempts by the newly professionalising foresters to assert their independence from competing interests such as those of agriculture. In this, forestry's moral dimension or its guardianship role, through its protection of climatic and hydrological decline as well as of timber supply, represented a fundamental aspect of the profession and its newly emerging culture. As Vasant Saberwal has observed in an influential article on this topic, in the twentieth century 'the continued opposition by the Revenue Department simply drove the Forest Department to a greater and greater use of an alarmist, and from the Forest Department's perspective, politically valuable rhetoric' – a theme I also take up in more detail in the next chapter.62

The use of interlocking environmental anxieties by foresters was clearly aimed at firming up support for their programme and its professional culture, with foresters shuffling the future of agriculture to the fortunes of forestry. This finding also contributes to an important debate centred on whether or not the so-called moral element of forestry dropped off the agenda of the IFS with the increasing commodification of forest resources evident in the latter part of the nineteenth century. The evidence of this chapter – and others in the book – supports the recent research of Greg Barton and Brett Bennett, who have challenged the interpretation that later Indian forest conservation focussed solely on commercial gain to the detriment of its earlier 'moral' emphasis on famine relief and flood protection.63 Famine relief and forestry protection works to prevent perceived climatic deterioration, soil erosion and flooding continued in this period. From the mid-nineteenth century, forest commodification and professionalism increased at the same time as climatic and soil erosion anxieties became more strident (note, also, Chapters 6 and 7). This chapter's finding also complicates Richard Grove's argument that forestry represented a radical critique of colonialism, by demonstrating that forestry supported the development of wastelands at the same time as it also regulated timber supply and protected agricultural interests. The next section explores the impact of German-trained scientists in Australasia, revealing a different pattern of forest conservation as a result of local environmental and political cultures preventing the successful translation of environmental anxieties into state policies on the scale undertaken in India.

Australasia

Set against the extensive areas controlled by the IFS, Australasian forest conservation appears limited and small-scale until towards the end of the nineteenth century. The need to please voters meant that Australasian colonial governments supported the overwhelming interests of the majority of settlers who wanted access to agricultural or pastoral land, needs sharpened by the flood of migrants in this period. In contrast, Indian authorities had more power to act in support of such interests as forestry, a situation many of them commented upon (Chapter 6). The relative importance of different forms of governance – and different levels of acceptance of government action – seems to have strongly shaped the role played by German-educated scientists in Australasia as much as it did for Scottish-trained doctors (Chapter 4).

The quickening pace of railway development in Australasia from the 1870s demanded hardwoods for sleepers, binding together economies and environments in different parts of the world. In Australia between 1871 and 1880, for instance, the length of railways grew about 1288 km, leading to the estimated loss of over 12,100 acres (4900 ha) of forest. Destruction accelerated rapidly over the nineteenth century, climbing to almost 48,000 (19400 ha) in the period 1881–90 and to over 90,000 (36,500 ha) acres in the last decade of the nineteenth century.64 Overseas railway building impacted on Australian forest supplies. As noted in Chapter 1, exports of Australian hardwoods met demand for railway sleepers from New Zealand, South Africa, Great Britain and even India from the late-nineteenth century. Settlement also placed great demands on wood, through its removal for agricultural pursuits, construction and firewood. By the late 1880s, for instance, Melbourne's population of almost half a million required from between 350,000 and 450,000 tons of firewood per year, most of which was transported by its developing rail network, which itself placed further demands on wood. The several hundreds of kms of railway lines in Victoria in the late 1860s increased rapidly to over a thousand by 1880.

Despite large-scale political indifference, in New Zealand and, to a lesser extent, Australasia's eastern colonies, a growing lobby began to emerge for the protection of forests to prevent the very environmental
disasters befalling other areas of the world. In New Zealand and the eastern Australian colonies, as in India, supporters urged highlands forest reservation, a policy removing forest conservation from direct competition with settler agriculture. In pressing for forest conservation in Australasia, German-trained scientists articulated environmental anxieties, attempting to spread the ‘gospel’ of scientific forestry among a largely indifferent populace. In Victoria and South Australia, the contribution of German-trained scientists to the articulation of environmental anxieties remained strong from the 1860s to 1880s, thanks principally to the influence of two important figures, but only really in South Australia did an effective forest bureaucracy briefly develop. In New Zealand, the German link appeared stronger in the 1840s and 1850s, through the extended visits of two German-speaking scientists, one of whose works appeared in parliamentary bills and forestry papers of the 1870s alongside other material on German forestry. After a hiatus, the German influence re-appeared alongside an American one in the 1890s and 1900s, principally through the impact of environmental anxieties inspired by ecological ideas. These upheld the importance of individuals in expressing environmental anxiety and in establishing state responses to it.

Different reasons accounted for the migration of German-trained scientists to Australia and New Zealand. Fired by scientific curiosity, many wanted to undertake research in exciting areas new to European science. Some, like those employed by the Godeffroys trading company of Hamburg and engaged on behalf of botanical collectors, came as scientific sojourners to parts of Australia and New Zealand. Others, like the wealthy Austrian-born Carl von Hügel (1795–1870), travelling independently, sought both adventure and new botanical species. Economic downturn and political repression influenced migration to Australasia, as it had to India. New economic opportunities also stimulated settlement. In the 1850s, for instance, many Europeans flocked to the goldfields of Victoria, later moving on to the Otago goldfields that opened up in the early 1860s.

Historian of science Rod Home believes that, in Australia, the German nineteenth-century contribution to science ‘was out of all proportion to’ the German population. Germans served in a variety of scientific capacities in Australasia, as geologists, mining engineers, explorers, botanists and in other technical positions. One of the most influential of these, the botanist Ferdinand von Mueller, came to Australia in 1847. With a doctorate in pharmacy from the University of Kiel on the local flora of Schleswig, Mueller directed Victoria’s botanical gardens, served as the Colonial Botanist and became a leading proponent of the eucalyptus, arboriculture and forest conservation (Chapter 2). Like most others articulating those concerns, Mueller regarded forest conservation as a necessity to ensure continued colonial expansion.

In Victoria, Mueller provided a firm and unwavering scientific voice for forestry protection, one largely unsuccessful in implementing effective forest management. Employing highly alarmist language, he drew attention to the devastating consequences of unfettered forest usage in Australia. In 1867, for instance, Mueller and five others drew up the Advisability of Establishing State Forests, a report using environmental anxieties to justify their recommendations. It, however, gained little traction. In 1871, Mueller returned to that subject, presenting an impassioned plea for forest conservation for the reasons of its maintenance of climate, rainfall, timber supply, hydrology, health, and economy. ‘Let us then take timely warning’, he observed

let us remember that denuded earth parts with its warmth by radiation, and is intensely heated by insolation [sic]; that thus in woodless countries the extremes of climate are brought about in rendering the winter-cold far more intense and boisterous, and the summer heat far more burning and oppressive. Let us remember why the absence or destruction of forests involves periodic floods and droughts, with all the great disasters inseparable there from.

Continuing in this impassioned tone, he asked rhetorically: ‘Shall we follow then the example of those improvident populations, who, by clearing of forests, diminished most unduly the annual fall of rain, or prevented its retention’? In outlining the advantages of forestry, Mueller noted that his main object was ‘to show in what manner a well-organised and yet inexpensive system of forest administration might check the indiscriminate destruction of the woods, without, perhaps, lessening the rate of the present yield’. As well as displaying remarkably wide reading, Mueller’s arguments reflected his German scientific education. This included, in particular, articulating the connection between health, aesthetics and forest conservation, links reminiscent of von Humboldt’s. Outlining Humboldt’s ideas, Mueller wrote that

I regard forests as a heritage given by Nature, not for spoil or to be devastated, but to be used reverently, honoured, and carefully maintained, entrusted to us only for a brief space of time, and to be cared for and surrendered to posterity as an unimpaired property,
with increased riches and augmented blessings, to pass as a sacred patrimony from generation to generation.\textsuperscript{76}

Mueller did not introduce German forestry methods directly into Victoria, but insisted on adapting them to meet the specific requirements of that colony's different climates, species, population and labour. Australia, he observed, ‘must follow an independent path ... because the systems of forest management adopted with so much advantage in Germany, France and Scandinavia, are here applicable only to a very limited extent’.\textsuperscript{77} These considerations informed his criticism of Clement Hodgkinson (1818–93), Victoria’s Assistant Commissioner of Crown Lands and Survey from 1861 to 1874.\textsuperscript{78} A proponent of forest conservation in Victoria, Hodgkinson favoured developing plantations following the tree planting systems of Prussia and Europe (care recognition of the importance of the regional diversity of German forestry techniques). Mueller totally disagreed with Hodgkinson’s approach, pointing out that ‘the systems of forest culture’ used in “Germany, France and Scandinavia are only to a small extent applicable here, where quite different circumstances prevail in reference to climate, population, labour, native trees, and trees eligible.”\textsuperscript{79}

Recognising the heterogeneity of Australia’s environments, in Victoria Mueller also pushed for the establishment of forest boards to meet particularly local needs. He also tirelessly advocated tree planting, distributing seeds throughout Victoria, the rest of Australia and the world, a reflection of his interest in acclimatisation and commitment to the idea that trees could significantly change climatic patterns and prevent soil erosion and disease (Chapters 2 and 6). Recognising his role as an environmental expert disseminating forestry ideas, Western Australia engaged him to survey its forest resources.\textsuperscript{80}

Mueller also drew his arguments from beyond Germany. His 1871 lecture, for instance, drew from North American as well as German environmental anxieties and responses. Mueller’s arguments initially contributed to the establishment of Local Forest Boards along the lines he envisaged and, later, to the 1876 Forest Act which consolidated the position of the Local Forest Boards and the Central Forest Board (established in 1874). Reservation commenced but in the early 1880s, the Victorian government revoked many reserves to encourage settlement. Late in that decade, parliament once again considered the need for forest conservation.\textsuperscript{81} The exhaustive Royal Commission on Vegetable Products examined the need for forest conservation and called in Mueller as an expert. Still pushing for the establishment of Local Forest Boards, Mueller reiterated the arguments he had made over several years: that managed forests provided a profit, regulated water flow and had the potential to significantly alter climates, for instance, by moderating the coolness of Victoria’s higher ranges and by attracting rainfall. Mueller stressed that forestry made use of land unsuitable to agriculture and would make use of the otherwise ‘little utilised’ Australian Alps through tree planting. Moreover, he pointed out that Victoria’s climatic diversity meant it could produce a variety of different timbers suitable to meet the colony’s (and export) needs: while rich in hardwoods, Mueller believed that the planting of softwoods as well as reservation of all remaining forestland in Eastern Gippsland, which settlement was only just reaching, would meet local needs for generations to come.\textsuperscript{82} As a result of the Commission, in 1888 a forestry department was established and George Perrin (1849–1900) appointed to head it, but, by and large, as Stephen Legg notes, ‘Victorian forestry policy consisted largely of outdated, piecemeal regulations that proved ineffective in preventing forest destruction’.\textsuperscript{83} Fascinatingly, too, a strong gold-mining lobby pressed government for more permanent forestry reserves and sustainable forestry practices to manage them, a result of which was the establishment of a more independent forestry service in the early-twentieth century. Between 1908 and 1912, over 1.8 million ha of forests were excised, although forestry overall gained 45,000 ha of forests.\textsuperscript{84} Part of the reason for Mueller’s limited effectiveness was political indifference, coupled with perceptions of the inexhaustibility of Victoria’s timber supplies. Indeed, compared with the pre-European forest cover of other colonies such as South Australia (5.6 million ha), Victoria’s forest resources were much more extensive, with estimates of its pre-European vegetation as high as 16 million ha.\textsuperscript{85}

In South Australia, German-educated and continental-trained scientists were also expressing environmental anxieties, but with greater success than in Victoria. One was a parliamentarian and therefore better able to push for forestry’s cause. Also the relatively scant forest resources of the colony placed a more obvious need to encourage forest growth. Richard Schomburgk (1811–91), botanist, viticulturist and Director of the Adelaide Botanic Garden, expressed a series of anxieties in works such as ‘Influence of Forests on Climate’. Expanding well beyond the scope of this title, Schomburgk pointed out the signal importance of forests in preventing drought and flooding, regulating water flows, attracting rainfall and in providing for the wants of society. Turning first to historical records and then to more recent examples, Schomburgk stressed that Australia and India’s ‘savannah’ was originally heavily timbered. For him, India, Mauritius and elsewhere provided cautionary tales of the foolhardiness of deforestation in affecting the climate and fertility of
the region. The 'desolation, the waste, and destruction of our forests have been so general that it now renders it imperatively necessary', he claimed, to prevent further deforestation and create plantations. Upping the moral ante, Schomburgk also stressed that tree planting could help to redress the destructive tendencies of humans, framing these actions as ones of stewardship. 'Let us hope', he declared,

that the times are past for ever when the progress of civilization was equal to wasting and desolating the surrounding nature. One thing is certain—a broad strip of wasteland follows in the wake of culture, and noxious weeds like henbane, solanum, thistles, nettles, &c., serve to mark the footsteps of men. Before him, Nature in all her beauty; behind him, desolation and hopeless waste. Looking at this picture, we have no cause at all to be proud of being called the Lords of Creation; but let us hope that the future generations will be wiser than the past ones.87

For Schomburgk, the role of forestry extended beyond the provision of timber for economic development (although these were important considerations too). Schomburgk presented interlocking arguments—as individuals such as Mueller or Sharpe did—about the role of forests and other environments in human society. For him, the sound management of nature meant improving and stewarding environments. Hence Schomburgk criticised the unexpected and unwanted aspects of environmental change, including the release of weeds and the creation of 'useless' tracts of land. He also campaigned for years against pollution and drew attention to the problem of soil erosion resulting from deforestation and the removal of native pasture. Furthermore, he advocated the need for South Australia to diversify its economy. Over-reliance on wheat growing, he warned, tied South Australia overmuch to the fortunes of shifting market demand and climatic variability. Better, he stressed, to have a diversified economy than to rely on one crop. Diversification could see the production of olive and stone fruit, the growing of hops, rapeseed, medicinal plants, even New Zealand kumara, introduced to climatically suitable parts of the colony (damp gullies). Given South Australia's drought, Schomburgk, moreover, looked to climatically similar areas for suitable introductions. He advocated, for instance, the introduction into the plains of South Australia of the pigeon pea (Cajanus indicus) from India, owing to its ability to survive droughts, and relied on a series of overseas reports, such as from the State Board of Forestry, in San Francisco, California.88

Schomburgk's work responded in part to the influence of Humboldt, whom he met while in Germany. It also reflected the influence of Schomburgk's older brother, Robert (1804–65), the well-known scientist and explorer of British Guiana and South America.89 Another tireless South Australian advocate of environmental anxiety and forest conservation throughout the 1870s and 1880s was a close friend of both Mueller and Schomburgk's, the Danish-born Friedrich Kirchaff, whom Mueller described as 'an enlightened and energetic gentleman' who 'has exercised great influence upon the resources of South Australia'.90 Enlightened and energetic Kirchaff certainly was. He held a first-class honours degree in botany from Kiel and trained at the University of Berlin. As a parliamentarian he introduced, in 1875, the Forest Board Act that led first to the establishment of forest boards and, in 1878, to the appointment of a Forest Conservator, John Edinle Brown.91 In stressing forestry's importance, Kirchaff cited a variety of environmental anxieties while also upholding his interests in agriculture (serving as the chairman of the Central Agricultural Bureau from 1888 until its closure in 1902). A measure of his impact is that his death marked a significant decline in state forest reservation. I explore in more detail the influences, and origins, of South Australia's forest conservancy in Chapter 6.92

In eastern Australia, Mueller, Kirchaff and Richard Schomburgk made use of colonial scientific societies and political systems to further their interests in conservation, by buttressing their arguments both with environmental anxieties drawn from different parts of the world and through the authority of their own scientific expertise. Their influence was tempered, however, by the political systems in which they had to operate and by the lack of a strong, independent tradition of state bureaucracy upon which to draw. Despite this, the relative scarcity of South Australia's forest resources contributed to the establishment of a forest bureaucracy and legislation thanks in part to Kirchaff's parliamentary efforts.

New Zealand: 1840s–1900s

Similar political factors stymied the attempts by German- and continental-trained scientists to establish forest conservation in New Zealand, even though these scientists expressed some of the earliest apprehensions about colonial environmental change. In 1843, for instance, Ernst Dieffenbach expressed considerable concern about settler deforestation, challenging prevailing belief and the propaganda of the NZC of
the fertility of New Zealand’s soils, most of which, the NZC claimed, originated from flood-deposited alluvium. Soil fertility, explained Dieffenbach, functioned differently in New Zealand to Europe. In the former, it relied on trees enriching soil with accumulated organic matter, rather than the other way around as in Europe. This meant, he explained, that settler deforestation was foolhardy and within a short time would exhaust soil fertility. Based on what environmental historian Vaughan Wood terms a geological approach, Dieffenbach’s reading of New Zealand’s soil was accurate: as settlers would discover to their detriment, deforestation destroyed the very source of the soil’s fertility.

Dieffenbach’s upbringing and attitudes underline the importance of continental scientific education systems, but so too religious sensibility, in shaping his environmental concerns. Although Dieffenbach hailed from a strongly religious family (his father was Professor of Theology at the University of Giesen), he instead chose to study for a doctorate in medicine at Giesen. Views highly critical of the ruling authorities and his implication in a planned storming by students of the Hauptwache (Main Guard House) in Frankfurt forced him into exile. After a period in England, he arrived in New Zealand in 1839 as a naturalist for the NZC settlement at Port Nicholson (now Wellington). Dieffenbach, like Schomburgk, had met Humboldt several times, with Humboldt’s influence as readily apparent on Dieffenbach’s scholarly output as it was on Schomburgk’s. Like Humboldt, Dieffenbach examined the interaction between people, plants and animals in the so-called New World. Chapters 1, 4 and 7 of the first volume of Dieffenbach’s two-volume Travels in New Zealand, for instance, investigated human impact on the colony’s environment in addition to criticising settler deforestation.

A later German-speaking naturalist, geologist and geographer who visited northern New Zealand presented similar arguments to Dieffenbach. Ferdinand von Hochstetter (1829–84) arrived in the young colony in 1859 as part of the Austrian scientific expedition circumnavigating the world in the frigate Novara. With Hochstetter’s interest in natural history, like Humboldt’s, forged in youth, Hochstetter followed his father’s enthusiasm for natural history and as a young man corresponded with many of the leading scientists of his day. Following theological and scientific training, Hochstetter completed a mineralogy Ph.D. at Tübingen University in 1852. Arriving in New Zealand in 1859, he remained in the colony for ten months, initially at the request of the Auckland Provincial Government who commissioned Hochstetter to undertake a district geological survey of coal resources as the rest of the expedition sailed home to Europe. Relying on detailed research and observations undertaken during extensive travels through the North Island and northern South Island, Hochstetter produced two important books – and numerous articles – on New Zealand’s geography and geology.

In his geography of New Zealand, published in German in 1863 and translated into English in 1867, Hochstetter warned of the disastrous consequences of burning and cutting down kauri forests. Repeated burning of native vegetation, he warned, represented a ‘perverse’ approach to soil management. Instead of laying down clover seed and grass immediately after firing, Hochstetter explained, settlers in the Auckland area ‘burn again and again’. With this, ‘the winds carry off the ashes; the rain is gradually washing the humus away, and at last nothing remains but the naked clay-soil’. Contrasting this method with ‘the correct one’ used by Maori, who sowed immediately after a burn, Hochstetter concluded that settlers’ actions represented ‘an abuse’ and resulted in ‘a sadly waste plain’.

Nor was this Hochstetter’s only criticism. Tracts formerly ‘covered with dense Kauri forests, and where large masses of Kauri gum are dug from the earth’, he had earlier cautioned, present now nothing, but waste, dreary, sunburnt heaths of notorious sterility, upon the white or yellowish clay-soil of which nothing but dwarfish Manuka shrubs (Leptospermum scoparium), and scantly ferns (Pteris esculenta) can grow. The colonists therefore say that Kauri forest[s] indicate a poor soil and a rugged non-agricultural country. This ought to prove a lesson for the future; individuals should not be suffered to ravage those precious woods, and to turn the country into a desert to the detriment of whole generations to come.

Wholesale deforestation horrified Hochstetter. Unless checked, Hochstetter believed it would make New Zealand a desert. Likening settler deforestation to the activities undertaken by ‘cannibal tribes as a stratagem to burn out the enemy’, Hochstetter’s analogy inverted the popular contrast between ‘barbarous’ native peoples and ‘civilised’ Europeans; the first supposedly reckless and barbaric, the second, rational and civilised. Hochstetter challenged the commonly held European idea that forest represented an unproductive resource, land lying idle in a state of nature – environments commonly associated with savage and barbarous peoples. Instead, forests were vitally
important to the welfare of agriculture and to the successful settlement of New Zealand.

While both Dieffenbach and Hochstetter spent relatively short periods of time in New Zealand, a measure of the scientific standing of the latter can be gauged by the appearance of his arguments in later conservation proposals. During New Zealand's first national parliamentary debates on forestry in 1868, both Thomas Potts and Charles O'Neill supported their arguments by quoting Hochstetter's passage in full. Likewise, during parliamentary debate of Premier Julius Vogel's Forests Bill of 1874, as well as in the forestry papers, Hochstetter's words again appeared in full. Appropriately enough given the connections between Hochstetter and Humboldt, in the 1870s the latter's arguments concerning the dangers to climate from deforestation also appeared regularly.

Reflecting their high standing, German forest methods appeared in New Zealand almost as de rigueur in discussion of conservation. Typical of such reports is one of 1874, a comprehensive survey of forestry in the German lands compiled by Captain (later Colonel) Inches Campbell Walker of the IFS for the New Zealand Government (see Chapter 6 for further details). Another example comes from J. R. Hacket whose recommendations illustrate the wide belief that, while German forestry methods were sound, they required significant adaptation to New Zealand. Recognising the 'highest scientific attainments' of German forestry and detailing its management practices, Hacket's 1873 paper acknowledged that 'European treatment of the forest is however not entirely applicable to N. Z. [sic] bush'. Unlike European forests, New Zealand's native trees, he pointed out, generally die if thinned and are particularly susceptible to fire damage. Nor, unlike Germany and France, did New Zealand legislation restrict the wandering of cattle, which impacted detrimentally on native forests. Several other differences also characterised German and New Zealand forests, including the faster growth and greater yield of New Zealand trees, and the loss of fewer New Zealand trees to hoar frosts and wind damage.

German forest methods — like those from elsewhere in the world — thus required considerable adaptation to most localities. The only example of direct application of German forest methods in New Zealand took place at the plantation of parliamentarian and historian Robert McNab (1864–1917), a keen advocate of both forestry science and catchment conservation for farmers. Along with North American forestry reports, McNab's bulging scrapbook included many reports on German forestry science. As McNab explained, he had adopted 'the German method' of tree-planting on the recommendations of the Imperial Royal Commission on Forestry and on the grounds that it was cheaper than English and Scottish alternatives. McNab's decision probably reflected the climate of inward southern New Zealand, whose distinct seasons and very cold winters would have more closely approximated to the growing rates and the climate of central Europe.

By the 1890s, New Zealand scientist Leonard Cockayne (1855–1934) was taking German and northern-European scientific influence in new directions through his support for the recent science of ecology (see also Chapter 6). Cockayne's German knowledge permitted him to access the ecological ideas of the Dane, Eugenius Warming (1841–1924), whose seminal ecological text, *Plantesamfund*, appeared in German in 1895, a decade or so before its translation into English. Cockayne applied ecological ideas, and those from the United States Department of Agriculture, to a variety of New Zealand's environmental problems from the late-1890s, producing Government-sponsored surveys of the Chatham Islands (1901), Kapiti Island, Tongariro National Park, Walpoat Forest and Stewart Island (1907–1909) as well as an influential 1909 report on sand drift in New Zealand. Cockayne yoked onto New Zealand's developing nationalism, the holism of ecology. He employed this ecologically nationalist argument to express a variety of environmental anxieties and to urge state conservation of forests and the reclamation of sand wastes (Chapter 7). A working knowledge of German therefore gave Cockayne a head-start over his non-German-speaking peers, allowing him to introduce these ideas into New Zealand well before Australia, whose conservation efforts relied upon ecological ideas much later than New Zealand's. Around the same time, the Dunedin-based scientist, G. M. Thomson (1848–1933), translated a number of articles from German for his New Zealand Journal of Science, and expressed environmental anxieties also shaped by ecology. Interestingly, it is likely that ecology influenced Cockayne and Thomson — as well as several others — either because they could access German ideas directly or through reading American forestry reports. Into the twentieth century, in light of ecology and the American forestry influences Australasian foresters increasingly criticised the scientific veracity of climatic arguments in favour of hydrological concerns (Chapter 6).

The impact of German ideas and scientists in New Zealand differed from the colonies of eastern Australia and India. German scientists in New Zealand responded to particular local environmental problems evident in early colonial New Zealand, notably the rapid deforestation
of kauri and soil erosion, but could not develop institutional responses because they left the colony after a relatively short time. Even if they had, it is unlikely in the laissez-faire political climate that they would have succeeded. Aside from the general applicability of continental forestry models, the particular influence of the likes of Mueller in Victoria or the German foresters in India did not eventuate in New Zealand for much of the nineteenth century. German and continental influences had particular resonance in New Zealand through the efforts of Leonard Cockayne, who drew ecological principles into finely honed arguments about the importance of local New Zealand plant species, tapping into increasing settler identification with native plants.

Conclusion

By dint of their particularly strong scientific, educational and bureaucratic experiences, German- and, to a lesser extent, continental-trained scientists expressed similar environmental anxieties across India, Australia and New Zealand. They acted as environmental experts, but state responses to their suggestions varied according to local environmental and political conditions. They enjoyed greatest success in India, where German-trained foresters did much to establish and professionalise the fledgling forest bureaucracies established by Scottish-educated doctors. In India, they instituted systematic forestry management drawn from their own particular educational and bureaucratic experiences, but adapted to the particular environmental and political requirements of different colonial situations. They also acted as ‘centers of learning’, as experts who advocated the principles of forest conservation. German bureaucratic and professional methods of forestry enjoyed less success in Australasia than in India because of the former’s different political systems, emphasis upon agricultural development and relative antipathy to widespread state scientific bureaucracies. The professional and scientifically rigorous basis of German forestry management was, however, widely admired in Australasian and Indian forestry circles, even if its particular forestry methods were not copied wholesale. As commentators recognised, German forestry techniques were adapted to environmental conditions, species and working conditions different to those found across Australasia and India. In the twentieth century, along with American models using similar ideas, ecological ideas came to shape the shift towards hydrological concerns evident in Australasia and India. Ecology encouraged fears about soil erosion and flooding because it emphasised the inter-relationship of environmental change and disturbance. More specifically, it encouraged forest protection by encouraging understandings of the uniqueness of plant communities and their significance, as well as of the impact of humans on such systems. This, and the exchange of forestry anxieties and models across India and the Australasian colonies, is the subject of the next chapter.
6
South Asian and Australasian
Forestry Anxieties and Exchanges, 1870s–1920s

[C]limes (like soils) may be made good or bad by human agency.¹

F. S. Peppercorne, 1880

I should view with very great anxiety any clearing of the hills ... and am convinced that it would be followed, sooner or later, by the most disastrous results, both in the shape of the deterioration of the climate, dangerous floods and landslips, and drying up of the springs and sources of rivers.²

Inches Campbell Walker, 1877

This chapter builds upon previous ones on the influence of particular groups to examine some of the direct exchanges of environmental anxieties and policies that shaped Australasian and South Asian conservation into the early-twentieth century. Advocates of forest conservation in Australasia drew upon the same centres of environmental knowledge (notably India by the 1870s, but also Germany and France and, by the early 1900s, the US) at the same time as they accumulated local knowledge of environmental processes and problems. This chapter reveals that they constructed similar arguments to justify forest protection, demonstrating that what Richard Grove identified as an ‘Edenic’ narrative of conservation on tropical islands also applied to Australasia.³

An Edenic argument went something like this: Colonisation and the unfettered example of private interests, proponents of conservation argued, caused an Environmental Fall, resulting in deforestation and, with it, alternating cycles of drought and flooding that threatened agricultural production. Only state-directed scientific forest conservation and

forestation, they argued, could reverse the excesses of private interests and restore agricultural prosperity to areas ruined by deforestation.

Through examination of the forests-climate idea in Australasia and India, this chapter also examines the changing relationship between environmental anxieties and scientific credibility.

Conservationists continued to locate forestry in highland areas unsuitable for agriculture, stressing that it made the most efficient use of otherwise ‘useless’ hill country and that it represented a complementary form of colonial development through the protection of lowland cultivation. For plantation agriculture, they emphasised the importance of leaving some areas in forest for climatic and hydrological reasons. Environmental anxieties about deforestation, therefore, rested on shared belief in colonial development and the natural fecundity of environments, even of those lands deforested centuries ago. Some believed tree planting could ‘restore’ unproductive landscapes, even in some cases bringing rain to arid areas and thereby assisting in the spread of civilisation and colonial development.

Tracking the changing emphasis of forestry anxieties, especially the decline in climatic concerns in the late-nineteenth century in Australasia, demonstrates the changing culture of scientific elites but also the importance of local differences in geography, politics and environment in shaping anxieties and in promoting forest conservation and forestry professionalisation. Whereas Australasian advocates moved away from climatic arguments, for a variety of reasons explored below, Indian supporters continued to emphasise their importance. Growing attempts to professionalise forestry through more refined scientific methods of managing forests took place slower and on a more limited scale in Australasia than India, due, principally, to the continued reluctance of state interference in society. Unlike India’s foresters, who continued to uphold climatic arguments in part because of their bureaucratically stronger position, in Australasia reliance on historical examples and anecdote for climatic anxieties gradually gave way to seemingly more ‘objective’ studies. Following precedents from the US, both Australasian and Indian foresters stressed the hydrological impact of forests in reducing erosion and flooding.

Circuits of knowledge and cultures of science

As previous chapters demonstrated, environmental anxieties seldom diffused neatly from one place to another. Scientific ‘ideas and instruments, texts and theories, individuals and inventions’, as historian
of science David Livingstone observes, spread unevenly 'across the surface of the earth'. Uptake depended on regional and local social, geographical and political circumstances, as well as on the role of individuals and journals in distributing information about the impact of deforestation. Similar anxieties and responses tied together legislation enacted in environmentally similar places if it promised to address similar environmental problems. Conceptualising such transfers of knowledge as a web usefully demonstrates the particularities of geography, politics and society that sustained such connections as well as the way they formed and re-formed over time.

In Australasia, shared institutional experience and scientific education – particularly expertise from Scotland, Germany and India – helped to shape regional and local scientific cultures and sometimes even institutional values (Chapters 4 and 5). A small conservation lobby sometimes emerged in a colony's land administration, or parliament, but, more generally, around colonial scientific societies. Members of the colonial scientific societies presented themselves as disinterested scientific observers who had the best interests of the colony at heart, and offered a vocal and sometimes powerful lobby group for conservation. In doing so, they selected those environmental anxieties or solutions which best suited their needs, either based on the applicability of general scientific principles to local needs or because of environmentally similar, and therefore more directly relevant overseas examples.

The adoption and adaptation of overseas models took place at different levels, from national and regional to local-level and personal exchanges. Geographical factors such as dissimilar climates, growth-rates, forest types and distribution impacted on forestry management as much as did culture, economics and politics. General environmental anxieties and processes were thus employed selectively to fit local circumstances and needs. Journal articles and letters alerted individuals to potential environmental problems in different localities. Visiting forestry experts distributed environmental information – acting as 'centers of calculation' in Bruno Latour's term – through their lectures, publications and advice. The Indian-Australasian and Australian-New Zealand webs examined in this chapter were just some of the many operating at the time.

Webs also changed – breaking and reforming over time – such that in Australasia and India American models assumed more significance and pan-imperial considerations and nationalism also came to the fore. Indian-Australasian, as well as Australian-New Zealand, environmental anxieties appeared strongest in the 1870s-80s, as India offered the most developed imperial example of colonial forest conservation then available. In Australasia, especially in the 1870s and 1880s, along with American and European examples, South Asian environmental despoliation fed colonial anxieties about the frightening effects of deforestation. Providing a successful model whose principles could be adapted to local Australasian circumstances, India's advanced programme of state forestry gave administrators the confidence to be able to solve existing and future problems. In the 1870s and 1880s, Australasian colonies leaned heavily on forestry experts, particularly from India, while late-nineteenth century New Zealand utilised forestry experts from Victoria. From the early 1900s, the US assumed importance in Australasia and India as a model for presenting and solving environmental anxieties. Coupled with local experiences of forest problems, in Australasia, US models signalled a shift away from climatic concerns towards those of the hydrological impact of deforestation. By the 1920s, although newly established national forestry institutions emerged in Australasia, reflective of both growing settler nationalism and a wider imperial forestry framework, the professionalisation of the discipline in Australasia still lagged behind India. Throughout, employment of categories such as 'Indian' forestry or 'South Australian' forestry is not meant to freeze-frame forest policy at one particular time and place. Neither is it meant to imply that policy from one region was transplanted unmodified into another. Over the nineteenth century, as previous chapters noted, the IFS increasingly developed its own culture, and professionalism, but it also continued to adapt the latest innovations in German and French forestry.

India-New Zealand environmental anxieties and responses, 1870s

As already outlined in previous chapters, amidst increasing rates of deforestation brought on by colonial development and, in particular, by railway construction, fuel, and building materials, anxieties grew about the large-scale impact of deforestation. They focussed on fears of an impending timber famine, in addition to hydrological and climatic anxieties. Forest conservation developed unevenly across Australasia. South Australia led the charge, and many other Australasian colonies had forest departments, but all were secondary to land development and consequently languished relatively behind other areas. Economic retrenchment led to the disestablishment of forestry departments in both the mid 1870s and 1880s in New Zealand, for instance.
With debate on state forest conservation gathering pace in 1870s New Zealand, several former civil servants from India such as Sir John Cracroft Wilson participated in provincial and national forest debates. Men like Wilson drew extensively on their direct experiences of South Asia to inform debate on New Zealand forestry. Personal testimonies supplemented reports that highlighted South Asian, and in particular Indian, forestry. Together with other models such as from France and the German-speaking lands, the South Asian model contributed significantly to the development of state forestry in New Zealand in the 1870s and 1880s. South Asian environmental anxieties and responses often appeared during debate on the 1874 New Zealand Forests Bill, championed by Vogel as a means to increase government revenue, secure future timber supplies and protect against climatic deterioration and soil erosion. Wilson pledged his wholehearted support for the Bill. As an almost fanatical upholder of the provincial interests he represented, Wilson settled permanently in New Zealand in 1859, having served as a magistrate and revenue collector for the EIC in Bengal, India (see Chapter 2). This vast experience moulded his forest anxieties. Inspecting his visit to Mauritius, Wilson praised its forestation for arresting earlier climatic deterioration. As one of the first islands to have forest climatic reserves, Mauritius’ deforestation and subsequent reforestation received regular mention among those concerned with resource management. To them, Mauritius presented an environmental lesson to New Zealand of the stupidity of deforestation and fuel to the conservationist lobby that could point to Mauritius’ environmental redemption through reforestation.

Mauritius appeared in the many and varied forestry papers tabled before New Zealand’s Parliament during readings of the 1874 Forests Bill. The papers carried the Earl of Kimberley’s warnings to the Governor of Ceylon, W. H. Gregory (Governor, 1872–7), that ‘the experience of Mauritius and other countries has so clearly shown the evil effect upon climate resulting from deforestation.’ Other writers in New Zealand such as the surveyor and climatologist, F. S. Peppercorne, upheld Mauritius for the same reason, a link also extending to one of its scientific institutes. In 1882, members of Wellington’s Philosophical Institute attended a lecture on Mauritius that presented a devastating assessment of the impact of deforestation on the island’s hydrology and climate. Following ‘the wholesale destruction of the forests’ and without any vegetation to retain the moisture of the previous rains, its author related how floods had ravaged the island, followed soon afterwards by ‘a long drought’. Forest conservation, the paper noted, was bringing ‘great improvement’ to the climate. W. T. L. Travers (1819–1903), a leading member of New Zealand’s scientific community and an expert on its environmental transformation, pointed out that this [paper] bore immediately on the question of forest conservation in New Zealand.

Wilson’s advocacy for Mauritius, then, was not unusual. As well as drawing from Mauritius, Wilson instanced his own experience in 1843 as officer in charge of a district bounded by the Himalayas, when he unsuccesfully petitioned to stop the indiscriminate destruction of a belt of sal (Shorea robusta). Only later, when ‘great difficulty’ arose in getting sal timber for gun carriages, did the Lieutenant-Governor visit the district, whereupon Wilson ‘showed him how valuable the promontory alluded to would be hereafter’. A forestry department, he noted, was finally created and ‘the forests have been conserved ever since’. India sparked much of Wilson’s interest in conservation, but he also brought ideas from other areas to New Zealand, so it is important to recognise the broader influences shaping his environmental views and his role as an environmental expert introducing into New Zealand a variety of forestry ideas. Wilson also put his ideas into practice, purchasing seven acres of forestland on the Port Hills, above Lyttelton (Christchurch’s port), to prevent its destruction. A deliberately lit fire, however, destroyed a forest that ‘had gladdened my sight for six years’.

Other examples of forestry in South Asia appeared in print in the 1870s and 1880s, ramming home the need for conservation in New Zealand. Ceylon furnished alarming examples of deforestation-caused drought and infertility, featuring in the Appendices of the Journal of the House of Representatives alongside other 1874 forestry papers collected from around the world. In one excerpt, John Douglas, Acting Colonial Secretary to the Government Agent, Central Province, Colombo, described deforestation as ‘an evil, which will ere long make itself felt among the planters themselves, when they find themselves unable to procure timber for general use, and specially firewood for their coolies’. New Zealand conservationists followed a similar argument to Douglas, presenting deforestation in comparably messianic terms as threatening New Zealand’s agricultural fertility and economic viability.

An Indian forestry expert for New Zealand

In 1873, the Otago Witness, a New Zealand provincial newspaper, called on the government to commission a report on forest conservation ‘by some intelligent and experienced member of the Indian Forest Staff’. Two years later, parliament appointed Scottish-born forester, Captain
(later Colonel) Inches Campbell Walker (1841–11), as the colony’s first Conservator of Forests. Walker came from Madras Presidency where he served as its Deputy Conservator of Forests. Most likely his recently completed survey of European forest practices had brought him to the attention of New Zealand authorities. A fortuitous meeting between Vogel and Walker’s brother, coupled with the enthusiasm for forestry of Sir James Ferguson (1832–1907), would also have helped Walker’s cause. A former Under-Secretary of India (1866), and New Zealand’s Governor (14 June 1873–3 December 1874), Ferguson supported forestry and was instrumental in providing Vogel with details of suitable candidates for the position of conservator.

As noted in the previous chapter, from the 1860s, India was fast developing a strong forestry model the envy of the British Empire and beyond thanks initially to the efforts of Scottish-trained and more latterly German-educated scientists. By the last quarter of the nineteenth century, it possessed one of the most advanced and powerful forestry services in the world, comparable only perhaps to German and French forestry from which it was derived. By 1900, for instance, the IFS controlled over eight per cent of India’s total land area. As well, the IFS had its own forest school in Dehra Dun for the training of all non-officers (established in 1878) and a cadre of well-educated forestry officials (Chapters 4 and 5). The efforts of Walker demonstrate the cross-influences at play in the development of forestry within empire, particularly the way continental and Indian forestry ideas needed to be adapted to meet the needs of local conditions in colonies such as New Zealand.

After compiling an exhaustive survey of the New Zealand’s forests, Walker presented his vision for scientifically managed forests in the colony’s parliamentary papers (1877) and in its only scientific journal, the Transactions and Proceedings of the New Zealand Institute (1876 and 1877). Mindful that the main thrust of settlement was development, Walker stressed the economic benefits of scientific state forestry to New Zealand. Quoting the impassioned writings of various European and North American authors, he associated their regulation of climate and soils with the preservation of New Zealand’s fertile and ‘smiling fields’. After the model of Indian forestry, Walker recommended the establishment of climatic reserves in New Zealand to protect against rainfall decline and increasing floods and soil erosion. Deforesting high altitude areas, Walker warned, would mean bidding ‘farewell to the smiling fields in the valleys [sic] below and abundant pasture on the lower slopes of the hills’. State forests, he noted, belonged in the uplands, because deforesting mountainous areas like those of the Southern Alps for sheep or cattle runs offered nothing like the ‘gain’ that ‘is generally supposed’. Poor soils, moreover, once deforested, would probably be washed away, leaving nothing behind but ‘arid hill-sides’. Having ‘little doubt that’ trees ameliorated the colony’s climate, especially on the South Island’s West Coast, New Zealand needed to afforest, declared Walker, especially in the relatively treeless inland South Island which lies in the rain shadow of the Southern Alps. Overall, Walker presented a comprehensive, though in parts contradictory, discussion of the climatic aspects of conservation. Relying on his own observations, and scientific hearsay, alongside his principle concerns of timber famine and hydrological change, he upheld forests-rainfall theory — even to the extent of ignoring his own experiments in these areas — and pointed out that unless the government protected some forests, disastrous droughts and floods would follow.

Since a key plank of Walker’s arguments rested on the forests-rainfall theory, he took time to study the colony’s temperature records and deforestation rates and establish a relationship between the two. Despite both his intention and increased deforestation rates, records of New Zealand’s average rainfall between 1866 and 1875 actually revealed a slight rise in the rainfall mean. Walker, however, dismissed the reliability of such figures owing to improvements in meteorological observations rendering the earlier figures unreliable. Walker’s efforts to measure the effects of deforestation on climate reflected growing attempts in India to increase the legitimacy of state forestry through recourse to statistics. From the 1880s, the IFS only began to accept climatic theories thanks to seemingly reliable meteorological evidence. As with other climatic conservationists, however, intuition and observation ultimately informed his belief in the powers of forests to attract rain: in Australasia, these would ultimately lead to its dismissal in scientific circles later in the century.

Economic pressure forced parliament to disestablish the fledgling forest service headed by Walker. Walker returned to India in 1877, but not before the reservation of over half a million acres (202,343 ha) of forest took place. His influence as an environmental expert also continued. As a respected environmental expert, Walker introduced New Zealand authors to a wide variety of theoretical works on forestry, from those by Alexander von Humboldt to Dr Croumble Brown (the Cape Colony botanist). His authority strengthened the lobby for reintroducing conservation, with many later advocates directly quoting from Walker’s New Zealand reports.
Later Indian connections: 1880s

While reservation of forests continued under New Zealand's 1877 Land Act, in 1885 Vogel formed another forest department under the State Forests Act (1885). Its Director this time came from within New Zealand. It received several applicants from the IFS (six) and Ceylon (one).36 One, H. Calthrap, explained he had spent just over three years in New Zealand after service in the Punjab Forest Department and as Forest Officer to one of the princely states.37 Possibly some had applied upon the recommendation of Walker, by now back in Madras.38 Other Indian foresters may have applied after reading articles on New Zealand forestry carried in the Indian Forester. New Zealand, one such article suggested, might provide 'a good opening ... for [Indian] Forest officers of training and experience' and possessed an ideal climate, 'exquisite scenery, and a society above the average'.39

Of foresters with Indian experience who applied, only one gained a position in New Zealand, W. Edgar Spooner, a former Superintendent of the Government Agri-Horticultural Gardens at Lahore.40 Recognising Spooner's skills, New Zealand's Director of Forests (1885–7) noted that he 'seems well qualified to take charge of the experimental gardens and plantations at the School of Forestry'.41 In 1887, Spooner assumed superintendence of the Klororoa reserve (near Whangarei, eastern North Island).42 He proved an energetic writer, publishing several articles in New Zealand on forestry and scientific agriculture drawn from his Indian experiences. In one, Spooner recommended that New Zealand follow Punjab's precedent in establishing a bureau of forests and agriculture, noting 'many plants now under cultivation in the Punjab [sic] and the North-Western Provinces of India that might be advantageously introduced into this colony'.43 Plant exchanges between India and New Zealand had already taken place, initiated by Wilson and others, but no evidence exists to suggest that Spooner initiated any in his role as Superintendent.44

New Zealand's second experiment in state forestry in the mid-1880s also elicited interest from the IFS. An anonymous IFS officer from Dehra Dun visited New Zealand to assess its new forestry service, writing a lengthy article on it for the Indian Forester of 1886.45 Although describing the State Forests Act (1885) as 'pleasing', the officer attacked New Zealand forest practices and policy. New Zealand's kauri forests, he complained, 'have been worked on no principle whatever, but simply as mines, and the reckless waste and destruction which has thus been caused is simply appalling'. He also rounded on the lack of professionalism evident in

New Zealand. According to him, despite 'all these well-meaning efforts to preserve their forests, the colonists have no one who really understands what forestry is, or how extensive forest areas should be managed'. The author pointed out that a miserly wage and the appointment of a biologist as 'Conservator of Forests', hardly augured well for the future of forestry in the colony.46 And so it proved. Economic decline yet again precipitated the abolition of the department in the late 1880s. Desperate to kick-start the economy, the new Liberal Government (1891–1912) used legislation and loans to encourage closer land settlement. The push for development – particularly in the forested North Island – accelerated deforestation, heightening fears of an impending timber famine at the same time as a move took place to reserve other forests for scenic purposes. Removing forests from reserved status in the 1890s provoked strident criticism from the Indian Forester,47 while evidence of frustration among the IFS over the relative backwardness of forestry in the colonies surfaced at the Select Committee on Forestry before the House of Commons. As India's Inspector of Forests, Dr Schlich put it – perhaps with New Zealand in mind – while the IFS desired to serve 'the colonies by allowing their educated forestry officials to visit them ... it had been found impossible to obtain adequate terms which would make it worth the while of these gentlemen to settle permanently in the colonies'.48 In the twentieth century, other forestry models, some derived from India, but now also from North America and ecology came to shape New Zealand forestry anxieties as they did Australasia thanks to the empire forestry model (see below).49

Victoria and India, 1880s–1900s

In the 1880s and 1890s in the Australian colony of Victoria, Indian models, and more particularly, Indian experts furnished terrifying examples of the impact of deforestation – in precipitating a timber famine, causing floods, increasing drought and altering temperatures. Indian foresters, as in New Zealand, provided expert advice to guide Victoria's forestry, while at the end of the nineteenth century a shift towards hydrological concerns also took place due to the influence of American models. A subsidiary connection between the Australian colonies and New Zealand demonstrates that models, anxieties and, later, expertise were shared across Australasia at different times in the nineteenth century.

Environmental anxieties and state protection of forests varied among the Australian colonies. As the previous chapter noted, South
Australia led the way in forestry circles, relying on the energetic Friedrich Kirchaufl, who also selectively borrowed aspects of New Zealand legislation in the 1870s (see below). By contrast, forestry in Victoria, Western Australia, NSW, and Queensland remained relatively backward. Examining Victoria as a case study reveals both the obstacles to forest conservation existing in the colonies and also reliance on experts from India to provide guidance. In his detailed study of colonial Australian environmental management, historical geographer J. M. Powell notes that Indian forestry and foresters provided important models and expertise in colonial Australia, in general, and Victoria in particular. The legacy of British India, notes fire historian Stephen Pyne, ‘rippled throughout the British Empire’. By the twentieth century, German foresters with years of experience in India staffed teaching posts in Scotland and England, influenced policy through publications on contemporary forestry and by writing their own early history of forestry. Avatars, as Pyne observes, appeared throughout the empire and beyond.

Reflecting the importance of influential politicians in shaping conservation after earlier suggestions, Sir Henry Loch (1827–1900), Victoria’s immensely popular Governor General (1884–9), lobbied for an Indian expert to report on its forests. Loch’s suggestion followed decades of complaints by concerned state officials and scientists of wasteful timber practices, problems magnified by the massive demand (and consequent deforestation) of timber in Victoria’s inland goldfields. Attempts to address deforestation included provision of Local Forest Boards in 1871, but with some exceptions, most failed. On Loch’s recommendations, Frederick A. D’Vincent, a Madras forester, arrived in Victoria in 1888, the same year in which parliament appointed a Victorian conservator of forests, George S. Perrin (who held the position until his death in 1900). Vincent’s bold and highly critical report censured both ‘[t]he entire absence of forest conservation and the political interference that permitted it. ‘The maintenance of a constant supply of timber and firewood’, he pointed out, ‘is of the greatest importance’ in most countries but especially so in Australia because of its great reliance on timber for building, fencing, and mining. The existing forest department, presently under the Department of Lands and Survey, he charged, is ‘worse than useless’. ‘[I]t impartns a false feeling of security to people who cannot inquire into its workings.’ The overall ‘general indifference as to the future’ resulted, Vincent explained, from the lobby of ‘powerful’ saw millers and splitters blocking forest conservation. The ‘influence of the electors’, he gloomily observed, ‘gives one little hope’ of the forests receiving adequate treatment ‘until the forest question is made a national one

and removed from party politics’. In this situation, and despite citing the model of India and Prussia, Vincent realised that the Indian system of a qualified officer in charge of the department, would not work in Australia owing to ‘the pressures to which the Ministers are constantly exposed under the system of popular Government’. In common with other Indian foresters, Vincent also stressed the state’s duty to rise above private interests to scientifically oversee a public resource like forests. In an ironic statement of the validity of Vincent’s criticism, his forest report was suppressed until the 1890s, owing to its trenchant criticism.66

In 1895, in the light of continuing deforestation, Victorian legislators again turned to an Indian expert to report on its forest estate and to recommend future policy. This time, Berthold Ribbentrop, former Inspector General of the IFS, examined Victorian forestry. Aware of Vincent’s report, Ribbentrop censured the state for its ‘neglect and waste ... as rampant as in the days when Mr Vincent framed his indictment against this management’. Political interference, he charged, hindered conservation and unless the state remove forests from the ‘whirlpool of party politics’, he predicted that ‘the reconstruction of the ruined forests will sooner or later become necessary at the cost of enormous sums’. Advocating that ‘a certain proportion of a country must be maintained under forest cover in order to secure the permanency of national progress and prosperity’, Ribbentrop echoed the concerns of many other Indian foresters:

The forests of a country must be looked upon as a capital left in trust for the whole community, and though it may be quite right to divert a superfluity of the capital into other and probably more profitable channels, a sufficiency of the original investment must be maintained, and of this the interest alone should be consumed.68

As with Wilson and Walker in 1870s New Zealand, Ribbentrop and Vincent in 1880s and 1890s Victoria urged increasing government intervention. Appealing to notions of public good, they argued that resources as valuable as forests could not be left to private interests. But their cries were not met by largely indifferent politicians. As these case studies demonstrate, without the advocacy of a powerful forestry lobby in parliament it proved difficult to gain traction on conservation in the settler colonies. Vogel’s inconsistent impact in New Zealand illustrates this, as does South Australian state forestry, which suffered a setback with Kirchaufl’s death.69 In the settler colonies, the whims of party politics often proved more enduring in a climate, which favoured land
settlement over forest alienation. Nevertheless, the efforts of Vincent, Ribbentrop and the other conservation-minded scientists and politicians across the Australian colonies, gave scientific legitimacy to environmental anxieties and, at least, raised the profile of conservation.

As with other experts, Ribbentrop advocated following aspects of Indian forestry, but adapted to local needs. Ribbentrop, for instance, recommended Victoria follow IFS practice in setting up forest working plans, even proposing the deputation of an Indian forestry officer to Victoria to oversee them. Victoria's new legislation, he believed, should follow the Upper Burma Forest Regulations 'as a pattern for the general lines of a Forest Bill'. Burma's act, he explained, 'is the most practical of Indian forest laws ... the outcome of the experience gained during nearly 30 years of forest legislation in the different provinces of the Empire'. Ribbentrop also arranged for the IFS to make available seed for the plantations of the 'Victorian Forest Department'. The Upper Burma Forest Regulations Ribbentrop referred to – recently instituted in 1887 following the cessation of the third Anglo-Burmese War – made provision for managing an underdeveloped and hitherto not-yet-surveyed area, and empowered the government to regulate teak extraction and the activities of private timber companies.

What became of Ribbentrop's suggestions? They also lapsed, submerged in the whirlpool of party politics and economic problems besetting the colony. Twelve years later the gold-mining lobby successfully pressured the Victorian parliament to pass the Forests Act (1907), creating an independent State Forests Department under the aegis of a Minister of Forests. The Act gave it departmental independence and, addressing the perennial issue of granting forest leases, the sole power to issue leases. Despite stabilising the area of forests, war and the consequent demand for closer settlement (especially through soldier settlement schemes) continued to place great pressure on forestland and conservation. By this stage, new developments and models had come to shape environmental anxieties and responses not only in Victoria but also in other former colonies (see below).

Australasian connections, 1870s–80s

While India provided an important model, as well as experts, for Victoria and New Zealand, environmental anxieties were also exchanged among the various Australasian colonies at different points in the nineteenth and early-twentieth centuries, a reflection very much of the see-saw nature of forest conservation in that period. Officials exchanged forestry reports, some even applying forestry legislation from one place to another while individual 'imperial careerists' also shuttled back and forth, with a few articulating environmental anxieties comparing one place with another.

Just as Alfred Sharpe (Chapter 3) provided a useful case study of imperial careerists shuffling from Britain to New Zealand to Australia, so too does Frederick S. Peppercorne of an individual applying hydrological and climatic anxieties to different parts of Australasia. Peppercorne worked as a surveyor and engineer in New Zealand's North Island and on Australia's east coast, publishing widely on human climatic modification. Articles and pamphlets appeared on forest-climate connections, irrigation works, transportation networks, geology and the interaction of water bodies and climate in New Zealand and Australia. Arriving in New Zealand in the early 1850s at the latest, Peppercorne left for NSW in the early 1880s. In New Zealand, he published several articles on forest conservation. Taking a global perspective in the 'Influence of Forests on Climate and Rainfall' (1879), he believed that New Zealand and Australia were 'in much the same position as India, with the effects of deforestation only beginning to bite. Europe and India's experience, he noted, provided a lesson to all, praising the latter's government which, responding to the reckless destruction of the Indian forests' and the 'greater frequency ... of drought and famine', had finally begun to conserve and plant trees. Unless 'immediate steps' towards forest conservation took place in Australia, he argued, severer droughts would occur more frequently and of a longer duration 'to the great detriment of ... pastoral and agricultural interests' alike. Two of Peppercorne's works appeared in 1879, extending his environmental anxieties. The first surveyed world irrigation works. Acutely aware of water scarcity in much of Australia, it focussed on India (18 pages in all), ending with a discussion of the need for irrigation canals in Australia to aid settlement, increase revenue and reduce aridity. Irrigation canals, wrote Peppercorne, should be supplemented by extensive tree planting that would help ameliorate its dry climate. His second publication of 1879 examined Indian-Australian climatic interconnections, stressing the necessity of irrigation canals to offset Australia's arid climate.

In Australia, Peppercorne tailored his environmental anxieties and responses to local needs. His 'Rainfall and Water Conservation in New South Wales' addressed the particular problems associated with that colony's insufficient and uneven rainfall distribution. Acknowledging that local circumstances affected climate, he noted that if Australia were
mountainous, NSW’s rainfall would be greater. Its western watershed provided insufficient rainfall for agriculture, he explained, while the problem in eastern NSW lay, not in the scarcity of rainfall, but in the unevenness of its distribution.69 He connected many of the problems associated with rainfall to deforestation. Instancing Victoria’s Yan Yean reservoir, he observed its flow had diminished owing to deforestation on its watershed. Congratulating South Australia for its more forward-thinking forest conservation policies, he upheld the example of government-led Indian irrigation schemes as ones NSW should follow. Although noting that Australia did not possess any large rivers such as existed in northern India, he nevertheless believed that much of its problems could be offset by such measures, in conjunction with forest conservation and tree planting.69

Peppercombe considered forests, climate, agriculture and environmental change comparatively through investigations into the weather phenomenon that is known today as ENSO.70 To Peppercombe, Northern India’s experience of irrigation and forestation suggested solutions to inland Australia’s aridity. In this, Peppercombe was not unique. Indian irrigation, promoted by individuals such as Alfred Deakin (who also looked to America), provided a powerful model of Australian water conservancy.71 Significantly, irrigation solutions in New Zealand did not feature in Peppercombe’s arguments, probably because of perceptions that New Zealand was largely well watered and thus did not face the problems of water scarcity encountered in Australia.72

Other visitors approached Australasian environmental anxieties differently. The naturalist Robert von Lendenfeld (1858–1913), who spent several years in Australasia in the 1880s, commented on forest conservation. Dismissing entirely the forests-climate idea, Lendenfeld instead believed Australasia’s geology generated very different environmental problems. While forest conservation was necessary in alpine Europe to hold ‘the soil to the steep mountain sides’ and thereby ‘prevent avalanches and floods’, Australia’s gentler slopes, he argued, rendered this unnecessary. He believed that Australia’s grassland would hold water and even improve rainfall. Hence, for Lendenfeld, clearing ‘of useless scrub and timber’ was ‘most advantageous’. In contrast, because of New Zealand’s largely mountainous topography, Lendenfeld stressed that ‘the adoption of stringent measures [of forest protection] is urgently necessary’.73 For Lendenfeld, local topography generated different environmental anxieties and responses. New Zealand’s mountainous landscape required upland conservation to prevent deluges and soil erosion, while Australia’s gentler slopes rendered this unnecessary.

Australasian tree planting as environmental redemption

While supporters of forestry generally favoured the preservation of existing forests, in some areas this was not practicable either owing to deforestation or to the prior absence of forests. Consequently, in many treeless areas, forestation took place. Local and regional governments often took the lead in legislation, followed later by laws introduced by colonial or national governments. State-directed tree planting, however, paled in comparison to the efforts of private foresters throughout Australasia. The present focus on official forestation presents only an overview of wider planting efforts that does not include private afforestation.74 As with standing forests, settlers planted trees for different reasons: to provide fuel and building materials; to increase rainfall or water retention; to help ‘redeem’ infertile areas and make cultivation possible. Normative assumptions about an originally fertile and well-watered land underpinned such hopes of returning nature to its productive state, echoing descriptions of the world before The Fall when, according to the bible, all of nature was fruitful. While certainly not all believed in the redemptive property of trees – with naysayers pointing out that vegetation depended on existing climatic and soil conditions – imbued by such ideas many overly optimistic forestation schemes nevertheless took place.

One of the most optimistic of those occurred in South Australia. To its new Conservator of Forests, John Ednie Brown (1848–99), appointed in 1878, the absence of trees explained Australia’s arid interior. Taking the forests-climate argument to extremes, Brown believed plantations could exert almost complete climatic control. Promoting the plantation of Pinus insignis and Pinus radiata, Brown was convinced they would render the dry, interior the garden of Australia.75 To convince everyone of his grand scheme, Brown had to challenge two dominant and popular theories of the time: the first, that ploughing, not tree planting, attracted rainfall; second, that rainfall patterns placed ecological limitations on settlement. Many South Australian settlers of the 1870s believed that ploughing attracted rainfall, especially since experience appeared to lend their ideas credence. Settlers spreading northwards across sub-tropical South Australia found, to their delight, above average rainfall.76 Heavy rainfall in late 1875 entirely washed away any lingering fears of drought, encouraging settlers to confidently fan out onto agriculturally marginal areas beyond Goyder’s Line. Demarcating land suitable for agriculture and pastoralism, Goyder’s Line was established by Surveyor-General Goyder in an attempt to
set ecological limits to settlement. Boosters in the rural press, as well as politicians, including even the Minister of Agriculture, ridiculed Goyder's idea and energetically promoted settlement. The late 1870s witnessed drought's return to South Australia and upheld the sagacity of Goyder's recommendations. Under drought conditions, settlers' dreams, like most of their crops, withered and died. A pattern of boosterism, climatic theory, settlement and disappointment followed in other Australian territories. Settlers pouring into other semi-arid areas employed both plough-rainfall and tree-planting theories to justify their actions, and drought stymied settlement in semi-arid parts of New South Wales, so it did in South Australia, twice. Remarkably, even many leading scientific figures voiced their approval of such ideas. Mueller in Melbourne, for instance, encouraged tree planting to ameliorate the climate and bring rainfall to the Murray Valley.

Despite his disdain for J. E. Brown's theories, Goyder promoted tree planting in South Australia for the prevention of timber shortages rather than rainfall increases. His anxieties about timber supply were eagerly seized upon by New Zealand's press in the 1870s and appeared in the forestry papers assembled for the 1874 New Zealand Forests Act. Goyder also corresponded with New Zealand's first Conservator of Forests, posting Walker clippings on South Australian forestry practice, which Walker subsequently passed onto Vogel. Goyder apparently visited New Zealand's South Island, recommending to Walker in 1876 that New Zealand adopt a measure stipulated in the Lease of the Pasturage of the Bundaleer Forest Reserve that gave ownership of all trees on private land to the state. In general, New Zealand and the other Australian colonies tended to favour South Australia as a model for forestry because of its more advanced programme of forestation and management. In 1885, for instance, a New Zealand parliamentarian advocated that its new forestry department should be modelled on South Australia's successful and self-financing one. In 1889, the arguments of South Australian forester J. E. Brown were also used to support Arbor Day in New Zealand.

South Australia's tree-planting legislation, in fact, originated in provincial New Zealand. In the 1870s, Friedrich Krichauff, the Danish-born botanist and South Australian parliamentarian, introduced into his state parliament several tree-planting and forest conservation bills. Krichauff's bill of 1873, as historical geographer Stephen Legg notes, was 'closely modelled on New Zealand's' tree-planting encouragement acts of 1871 and 1872. In December 1873, Krichauff observed that his Bill 'had adopted the bonus of £4 from the New Zealand' tree-planting legislation. The following year, when promoting his Forest Board Bill, Krichauff extensively discussed, and quoted from, Vogel's address of 1874 to the New Zealand Parliament, paying particular attention to the Premier's discussion of the climatic effects of forestry. Other examples reinforced New Zealand's influence on South Australian debates in the 1870s. In 1874, a South Australian parliamentarian asked whether South Australia's Forests Board 'would be similar to the Forest Board of New Zealand', whose chairman was paid. Krichauff replied that, 'upon the recommendation of His Excellency [the Governor] they could allocate certain lands, as under the New Zealand Bill. South Australia's early forestry legislation owed much to the example of New Zealand's, clearly demonstrating the cross-fertilisation of environmental anxieties, forestry ideas and legislation between these areas in that decade.

The tree-planting legislation upon which Krichauff's legislation drew developed out of provincial New Zealand concerns of an imbalance in the distribution of forests. It probably appealed to South Australian legislators because, compared to other colonies, South Australia had relatively modest forest resources, so had to 'devote much more attention to plantation work than ... [its] neighbouring colonies'. New Zealand's problem, as a Canterbury politician explained, arose because there was too much forest in the North Island but far too little in the South. Attempting to correct this imbalance, in 1858, the South Island province of Canterbury enacted a tree-planting act: in return for which, settlers received a free grant of land. In 1872, The Forest Trees Planting Encouragement Act, modifying the earlier provincial legislation, passed with slight amendments in the national parliament. Most parliamentarians accepted the need for such a measure, particularly in the relatively treeless provinces of Otago and Canterbury, where it enjoyed by far the greatest success. The Act awarded planters of trees either a free grant of two acres for every acre of land planted in trees or a land order, redeemable later, not exceeding £4 in value. This legislation enshrined the principles of tree planting for fuel, construction, climatic control and soil quality. As John Gillies explained, tree planting in dry Central Otago 'would convert that district into the garden of Otago' by bringing more rain to the region. After the Act's introduction nationally, its provisions were eagerly taken up in relatively treeless areas such as parts of Canterbury, Otago and Hawke's Bay.

Forestry advocates in the different Australian colonies upheld New Zealand most often in the 1870s because of its initially impressive forests department. In 1874, for instance, Mueller wrote to James Hector of his admiration for Vogel's Forest Bill, after an Otago friend had sent him a copy of Vogel's speech of 14 July 1874 on forest conservation.
'The whole [attempt by Vogel]', gushed von Mueller, 'evinces much true statesmanship and wise foresight; and which I have preached here for years to deaf ears your colony has made the first real step to the State administration of the forests and also South Australia'. In 1876, a Victorian commentator praised New Zealand's advanced state of forestry, suggesting that Victoria also avail itself of the Indian forestry expert. Overviews of early New Zealand measures appeared regularly in reports on Australian colonies' forests.

By the 1890s, with New Zealand's forest area decreasing due to excision and pricked into action by concerns expressed by the 1895 Timber Conference, New Zealand's parliament employed Victoria's Conservator of Forests, George Perrin (1849–1900), clear indication that New Zealand forestry had fallen behind even Victoria's. An exhaustive 56-page report followed. Witnessing at first hand 'the ruinous destruction by fire from one end of the colony to the other' during his national forests tour, Perrin concluded that New Zealand forests 'urgently needed' protection from fire. High country pastoralists burning 'timber off from the hilltops and above the head-waters of rivers' represented 'a crime against the nation', he charged. 'Nature is never slow to avenge herself', he warned. '[S]uch reckless disregard of her natural conditions', he pointed out, 'results in flooded farms and ruined settlers'. South Island colonists, Perrin continued, 'have indeed only to use their eyes, and they can see for themselves the evil effect of the system I condemn so vehemently'. Through the efforts of Perrin and the Timber Conference, a Forests Branch, under the Department of Lands, was created in 1896 and largely undertook tree planting, but faced many of the same problems which beset colonial forest departments across the Tasman: located within and under agricultural or mining departments, forest conservation received only secondary attention.

**Empire forest conservation, climate debates and professional cadres**

With the growth of nationalism and, in 1901, Australian federation, the kinds of forest bureaucracies staffed by professionally trained foresters envisaged by the likes of Walker in New Zealand or Ribbentrop in Victoria, gradually emerged, particularly after World War I, which revealed to British planners the need to secure imperial wood supplies and which effectively marked the ascent of empire forestry. In this period, from roughly 1900 to 1920, a succession of independent forest departments emerged across Australasia under the aegis of emerging state socialism. With increasing professionalism, Australasian foresters by and large dropped the climate-forests link as a result of the increasing influence of American forestry models. In this period, as part of that wider process of professionalisation, educational establishments were established. Victoria created its own School of Forestry at Creswick in 1910, while the following year, South Australia's Adelaide University offered a Bachelor of Science in the subject. NSW also opened a forestry training school at Narara. Across the Tasman, Canterbury (1924–34) and Auckland (1925–30), both colleges of the federalist University of New Zealand, began to offer courses in forestry.

As noted in the previous chapter, 'centers of calculation' in the training of forestry had earlier emerged in 1885 at Cooper's Hill at the Royal Engineering College; training transferred in 1905 to Oxford University. Other university courses soon opened elsewhere in Britain. They formed part of a growing imperial movement manifested most strongly in a series of Empire Forestry conferences, begun in 1920. The empire forestry movement aimed to co-ordinate research and training and to provide for an effective lobby group for the interests of foresters and forestry at both imperial and national levels. Holding regular conferences, publishing reports, and establishing the Empire Forestry Association and an Imperial Forestry Institute at Oxford University for postgraduate forestry training, it sought to increase the professionalism and influence of forestry. Its Standing Committee, as Ravi Rajan notes, even had the ear of the Colonial Office. As Joe Powell perceptively notes, interwar American and empire forestry conservation programmes influenced each other through the cross-fertilisation of ideas and approaches to the state-directed management of resources while also responding to particular local circumstances. Effectively, it reflected the reality that many other colonies and states were developing forestry models previously only evident in India, Germany and France.

Despite increasing professionalisation, locality remained crucial in understanding forest conservation. Australia, as Brett Bennett has observed in an important study of its forestry education post-federation, did not fit perfectly within the empire forestry ideal espoused during the early nineteenth century: it lacked a national forestry policy, had no national forestry school and any esprit de corps that existed among foresters was more often regional than national or imperial in its allegiance. The condition of Australian forestry was a product of Australia's distinct geography and social and political history.
Foresters in South Australia and Victoria, in particular, he notes, did not support C. E. Lane Poole’s newly-created Australian Forestry School (1926), which he formed on the back of his European and imperial forestry experience. Meanwhile, Canterbury and Auckland colleges bickered among themselves about who should control forestry in the dominion. Organisation in Australasia thus remained largely ad hoc, with ‘imperial oversight ... limited to advice and persuasion’. In this tumult of competing local, national and imperial interests, forestry professionalism took place slowly, and even as late as 1928 Lane Poole could declare that only 15 fully trained foresters lived in Australia. It seemed that the ideals of university-educated foresters, note Michael Roche and John Dargavel, did not initially fit with Australian ideals of practical on-the-job experience. In 1935, graduates of the Australian Forestry School formed the Institute of Foresters of Australia, open to only those with a forestry diploma or Bachelor of Science degree, and began publishing its own journal, *Australian Forestry*. Similar developments took place in New Zealand. The New Zealand Institute of Forestry was founded in 1927 while *The New Zealand Journal of Forestry* first appeared in 1937.

**Australasian and Indian climatic concerns and professionalism**

As well as gradually increasing acceptance of government intervention in Australasia, the articulation of particular kinds of environmental anxieties also played a role in increasing state forest bureaucracies. With the American influence supporting growing local evidence of soil erosion, foresters in both New Zealand and Australia deliberately dropped the climate-forests link because it undermined their claims to scientific legitimacy. Although in India increasing emphasis came to be placed from the 1920s on hydrological problems, largely based on US models and experience in northern India (see next chapter), the climate-forests idea did not wholly disappear.

The American shift, also apparent in many Australian colonies, appeared strongly in New Zealand’s 1913 Royal Commission on Forestry. Its findings also reflected the growth of ecological and aesthetic arguments for conservation and indicate a clear movement away from climatic arguments in favour of hydrological anxieties. The Commission’s report on climatic and scenic reserves, indigenous forests, forestation and forest management recommended extensive upland forest reservation for water and soil conservation purposes as well as for shelter. The report stressed the importance of forests to the farming economy, pointing out the dangers inherent in deforesting uplands. Deforestation would, it warned, ‘be a constant source of danger to the farmlands on which the prosperity of the Dominion so greatly depends’. With this in mind, it recommended reservation of the entire upper portion of ‘the North Island dividing range’. The Commission emphasised its utilitarian orientation, and the penchant for settlement then current, by advising the removal of some existing reserves either for settlement or forestry purposes, a total area comprising 68,698 acres (27,519 ha). By this time, too, an increasingly urbanised, New Zealand-born European population was coming to view New Zealand’s landscapes, birds and forests as symbols of new national sentiment. This, as well as the growth of tourism and the realisation of the great losses of forestland and extinction since colonisation began, led to the reservation of large areas of otherwise economically valueless areas for national parks and scenic reserves. By 1914, this had increased in extent to 2 million acres (809,371 ha), at the same time, as revocation of some forestland occurred in order to expedite settlement, 623,257 acres (252,223 ha) in all from 1890–1919. The newly formed State Forest Service under its first Director, the Canadian Leon McIntosh Ellis (1920–8), greatly expanded the area of forestland either reserved (2 million acres [809,371 ha] or provisionally designated as state forests (5.5 million acres [2,225,771 million ha]), as well as significantly expanding plantation forestry.

The New Zealand scientists who contributed to the 1913 Forestry Commission’s recommendations referred closely to US forestry, a development also evident in the colony’s publications, which increasingly carried the latest North American research on the forests-hydrology link. With this influence to the fore, forestry lobbyists in New Zealand gradually dropped the forests-climate link, realising that, in New Zealand’s context and in light of US examples, it did not help their claims of scientific and professional legitimacy through which they hoped for a stronger state forest bureaucracy. In the US, engineers and meteorologists had challenged the scientific legitimacy of the forests-rainfall arguments put forward by foresters. In response, foresters abandoned the argument entirely because association with its scientifically unproven claims harmed their prospects of increased government support and because it proved impossible to obtain accurate scientific data either on forests-rainfall or forests-temperature connections. Instead, in the early-twentieth century, United States Forestry Service officials played up the woeful consequences of deforestation on flooding and soil erosion, deliberately embarking, as historian Ashley L. Schiff notes, ‘on a crusade to convert
the country to conservation'. What made such moves possible in the US was the growth of the progressive movement, which sanctioned a more active government role in society. Reflective of the increasingly international milieu in which forestry was operating, Gifford Pinchot, the Yale graduate who trained under Dietrich Brandis, was strongly influenced by the model of Indian and continental forest conservation while his department, in turn, came to figure more prominently in Australasian conservation efforts from the end of the nineteenth century. The progressive model also began to resonate in Australasia because of the beginnings there of what William English Walling called agrarian state socialism, marked by policies of land redistribution, the beginnings of welfare provision and increasing government support for science.

New Zealand’s 1913 report also exemplified the move towards US models and the use of ecological arguments tailored to local needs to support the conservation of New Zealand’s native flora and fauna. An article by Dr C. A. Cotton (1885–1970), lecturer in Geology at Victoria University College, Wellington, praised the now classic American work, ‘Denudation and Erosion in the Southern Appalachian Region and the Monongahela Basin, 1911’. Locality continued to figure prominently in encouraging connections between different areas. Geographical similarity of that region to New Zealand, Cotton noted, rendered the American work ‘of special value’ to the Dominion as it contained ‘a very careful study of the results of reckless clearing in a climate which appears to be very similar to ours’. The report, Cotton continued, reached two conclusions, first, that the loss of tree roots following deforestation causes slips, thereby eroding away surface soil and rendering the slopes absolutely barren. The second result is, he noted, ‘very much more far-reaching: the soil exposed by reckless clearing is washed off, and when clearing has been resorted to too much at the headwaters of streams that material is carried down-stream, leading in the lower courses of the rivers to a much greater liability to flooding’. The report Cotton quoted resembled an earlier (1907) highly alarming tract full of insufficient data and hyperbole employed by the United States Forestry Service to present as conclusive the flooding-forest link. Although using scientific language, Cotton still employed the same scare tactics as earlier conservationists.

The article contributed by Cotton to the Report, ‘Remarks on Erosion of Slopes in New Zealand’, discussed the geological and vegetative factors affecting erosion, emphasising that geology just as much as vegetation affected water flow. The report referenced other international work, including Professor I. Bowman's *Physiography of the United States, and Principles of Soil in Relation to Forestry* (1911); Copenhagen Professor, Eugenius Warming’s *Ecology of Plants* (1909); and Bernhard Fernow's *Economics of Forestry* (1902). Bowman’s work highlighted the horrifying loss of soil occasioned by deforestation. In 50 years, he claimed, a single lumber merchant may destroy soils that took thousands of years to develop. Warming and Fernow, meanwhile, lectured on the importance of forests in maintaining soils and, in Fernow’s case, of also protecting against flooding. The Commission also sought advice from other scientific experts, such as Charles Andrew Chilton (1860–1929), holder of the Chair of Biology and Palaeontology (later Biology) at Canterbury College, and Leonard Cockayne. Although the Commission chose works (such as those by Fernow and Cotton) stressing the relationship between forests and flooding and showing the complexity of hydrological systems and the dangers of ascribing to forests an overriding influence on river flow, it still fell back on highly alarming language. Without forests, it warned, the colony’s mountains and hills would be a constant source of danger to the farm lands on which the prosperity of the Dominion so greatly depends. New Zealand’s conservationists, including respected scientists such as Leonard Cockayne, thus continued to rely on a language of hyperbole and alarm, using this as a deliberate stratagem to push their ‘cause’ – conservation for hydrological reasons. They also emphasised their scientific credibility by dismissing the climate-forest connection. Tellingly, for instance, Chilton, citing the lack of supporting scientific evidence, categorically stated that forests did not affect rainfall.

He and others made these arguments for several reasons. First, excepting Cockayne, both Cotton and Chilton were scientifically educated professionals teaching science in the University of New Zealand. As an ecological pioneer, Cockayne also conducted scientifically informed experiments to determine the local-level impacts of wider processes of landscape change (Chapters 5 and 7). This, combined with Cotton and Chilton’s background, would make all three suspicious of any theory that could not be easily scientifically proven. Second, their suspicions of climate ideas would have been reinforced through their reading of North American literature and the realisation that US foresters managed to expand their influence, in part through espousal of hydrological anxieties and by dropping climatic concerns. A variety of opinions had long existed on the relationship between forests and climate, it was simply now that in New Zealand the idea became discredited as New Zealand’s aspiring professionals dismissed it outright. During debate
of Vogel’s 1874 Bill, for instance, William Buckland, MHR for Franklin (south of Auckland), believed that forests only exercised local climatic influence. In New Zealand, unlike in the US, where meteorologists led the charge against the forests-climate theory, New Zealand’s meteorological service relied on non-scientifically trained staff, several of whom even upheld the local climatic influence of forests. Third, it seems that, as noted at the time, geographical and climatic similarities between New Zealand and North America lent the latter forestry’s reports a particular relevance to the dominion. It meant that North American findings and techniques required less adaptation to a New Zealand context than those of continental Europe or India.

As previous chapters demonstrated, in many of the Australian colonies— which, from 1901, became states in a federalist system—climatic arguments figured strongly as justification for the establishment of state forest management programmes. Influenced by American models as well as by growing evidence of inland deterioration (Chapter 7), most notably in the Western Lands District (western NSW), foresters in Australia also dropped climatic arguments. The infamous Federation Drought, lasting from the mid 1890s to around 1903, further focused attention on the need to maintain soil fertility, prevent erosion and ensure moisture conservation. Ironically, too, as in New Zealand, several colonial governments, such as South Australia’s, also excised forest reserves ‘as a cheap means of offering rural relief’.

In India, the situation differed. Although American ideas on hydrology and soil erosion appeared more frequently in Indian debates, they did not necessarily signal a decline in the forests-rainfall theory. Hydrological concerns increased because of soil erosion, guillying and flash-flooding experienced in much of northern India (see next chapter). The forests-climate argument, however, remained. Vasant Saberwal believes whereas over the twentieth century ‘American forestry gradually gave way to a more quantified approach’ to the question of the forests/climate/hydrological influence, Indian forestry remained ‘largely rhetorical, and non-experimental’. Debate on the veracity of the forests-climate question filled many pages of the Indian Forester in the nineteenth and twentieth centuries. B. H. Baden Powell and others trenchantly criticised the forests-climate link, but it gained powerful support from foresters like Dietrich Brandis (Chapter 4) and even meteorologists such as H. F. Blanford (1834–93). Indeed, in 1908, an enquiry specifically set out to determine whether or not forests influenced rainfall, but it, as with the other 13 papers on the topic published between 1906 and 1913 in the Indian Forester, could reach no consensus. In 1900, Berthold Ribbentrop, for instance, held that while forest distribution depended primarily upon its geographical position, its elevation, the configuration of the ground, and other cosmic causes which are independent of local circumstances, it can hardly be denied that the existence or non-existence of large well-wooded areas in a country naturally capable of growing forests affects its climate in a very marked degree.

Citing evidence from ‘old residents’ in India who argued that rainfall decline followed deforestation, Ribbentrop also drew on the detailed scientific experiments of Ferdinand Ebermayer’s Die Physikalischen Einwirkungen des Waldes auf Luft und Boden und seine klimatologische und hygienische Bedeutung (The Physical Impacts of Forests on Air and Earth and their Climatological and Hygienic Dimensions). Ebermayer, Professor of Chemical Agriculture, Earth Sciences and Pedology at the Royal Bavarian Central Forest Teaching Academy, conducted his experiments at the Forest Research Station, Bavaria, at different times of the year. Although hardly new—the work first appeared in 1873—Ribbentrop argued that if Ebermayer’s conclusions revealed forests’ considerable temperature modification and rainfall increases in temperate Germany in summer, what greater impact must they have in India, ‘with such a fierce climate’? There was also, as Bennett and Barton have noted, general resistance to American forestry methods among many IFS officers. In the empire forestry movement, the veracity of forests-climate debates would remain a point of tension among foresters from different backgrounds.

Conclusion

Environmental anxieties about the effects of deforestation drew together South Asia and Australasia at different times in the nineteenth and twentieth centuries. In the 1870s and 1880s, South Asian examples and experts provided sources and solutions to New Zealand’s environmental problems, with an Indian forester leading New Zealand’s first forestry department. In Australia, Victoria also employed IFS foresters as experts in the 1880s and 1890s. They produced a series of damning reports on the inadequacies of forest conservation that reflected problems of having to protect forests through democratically elected state parliaments whose main aim was land settlement and not forest conservation. Anxieties also connected the various Australasian colonies. In the 1870s,
New Zealand and its treeless provinces provided a model of tree-planting legislation for South Australia. After the 1860s, Victoria, as well as New Zealand, looked to South Australia for the regulation of forests, when in both Victoria and New Zealand forest conservation took a step backwards with the decision to promote policies of closer settlement. By the late-nineteenth century and into the twentieth century, colonies like Victoria and New Zealand gradually drew on US models of environmental anxieties and responses. These emphasised the impact of deforestation on river flows as climatic anxieties fell from favour. Faced with criticism of the climate-forests connection, Australasian foresters disassociated themselves from scientifically unreliable theories and instead aligned themselves with hydrological concerns in the hope of gaining increasing bureaucratic power over forest control. In India, however, because of its relative strength vis-à-vis Australasian forest bureaucracies, the IPS continued to uphold climatic anxieties alongside hydrological concerns, the latter reinforced by its own on-going problems of erosion in northern India. In the twentieth century, despite attempts to co-ordinate forestry on a more imperial scale, the particularities of geography, politics and culture meant that environmental anxieties and responses continued to be articulated through local experience. Just as South Australia in the 1870s pursued tree-planting policies because of timber scarcity and because of a powerful parliamentary forestry lobby, so other areas such as provincial Otago and Canterbury made widespread use of forestation policies. Political and professional rivalry, coupled with the complexity of different local environments, prevented the Canberra-based Australian Forestry School from imposing its model of professionally trained foresters on Australia until the 1930s. New Zealand forestry, similarly, professionalised slowly in light of different local circumstances. Throughout, this chapter has underlined the interaction and changing nature of different anxieties and solutions in response to shifting political, environmental and social contexts. The next chapter examines anxieties about desertification and discusses its impact on the development of more professional state forest bureaucracies in Australasia.

7

Thwarting Imperial Agricultural Development: The Spectre of Drifting Sands, 1800s–1920s

Ascending one of the sand ridges I saw a numberless succession of these terrific objects rising above each other to the east and west of me ... The scene was awfully fearful, dear Charlotte. A kind of dread came over me as I gazed upon it. It looked like the entrance to hell.¹

Charles Sturt

Private owners ... would only be too glad ... if they could discover some cheap and easy method of converting the desert into a Garden of Eden.²

F. Codrington-Ball, 1894

Desert and spreading sands represented the antithesis of all that settlement promised. They were terrible, un-Christian, an evil to be remedied. Threatening not only settler economies, they also made a mockery of Christian injunctions to make land fertile, to turn land to productive use. Destroying productive land through deforestation, as previous chapters noted, impelled conservation and tree planting as well as the establishment of forest bureaucracies in some parts of South Asia and Australasia. Evidence that human activities were literally creating desert by encouraging sand drift elicited a similar language of fear. Officials and individuals viewed spreading sand as an 'evil' imperilling fertile plains and prosperity, but believed that environmental redemption could follow through well-organised reclamation. Acknowledging the role of humans in deforesting or overstocking coastal and inland areas, initiatives involved local measures – and occasionally legislation – undertaken by private individuals and local bodies. By the