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Welcome to the first issue of 2020. In ‘American vines, European potatoes: An evolutionary history of European migrations in southern Brazil’, Claudio de Majo and Eduardo Relly examine the differing environmental and social experiences of two migrant groups to the state of Rio Grande do Sul. Germans and Italians, the authors show, each centred their activities on growing potatoes and a particular variety of grape. De Majo and Relly’s lively work as a whole demonstrates the fascinating overlay of migrant expectations, environmental reality and economic opportunities. As well, it charts the complex pathways of species introduction and reintroduction.

In contrast to the broad sweep of de Majo and Relly’s article, Alexander Trapeznik and Austin Gee explore the impact of the motor car’s introduction into early twentieth-century New Zealand. In “The madding Wheeles of brazen Chariots rag’d; dire was the noise”: Motoring and the environment in New Zealand before the Second World War, they unearth concerns about dust, noise and visual pollution amongst the public. Their work provides a valuable southern hemispheric perspective on an area of scholarship dominated by research from North America and Europe.

Kate B. Showers presents her third and final article on biofuels. In ‘Biofuels’ unbalanced equations: Misleading statistics, networked knowledge and measured parameters. Part 3: Modelled marginal and spare land versus observed ecosystems’, Showers shows the consequences of model-driven policies to shape African land use. Her work is a cautionary tale of the need to interrogate closely systems of modelling and production as we seek to sever our links to fossil fuel production. Showers’ work does not advocate a rejection of biofuels, but rather a more careful awareness of their production and environmental and social impacts. As she concludes: ‘Biofuels can provide an alternative to fossil fuels, but applying an industrial approach to their production simply continues the destructive logic responsible for global degradation.’
In ‘British huntswomen in colonial India: Imperialism and gender hierarchies, 1890–1921’, Vijaya Ramadas Mandala examines an early manifestation of another aspect of global degradation. Mandala’s work considers the manner in which ‘British huntswomen successfully contested the limitations of female participation (imposed by the male-dominant Victorian society) by partaking in big game pursuits in colonial India’. Through a detailed study of figures such as Nora Beatrice Blyth, Mrs W. W. Baillie and Isabel Savory, Mandala illustrates at once the manner in which such women upheld imperial ideals, utilised indigenous knowledge and engaged with local nature, all the while using the opportunity India presented to extend their own role in hunting.

In the final article, ‘Temporalising nature: Chronologies of colonial species transfer and ecological change across the Indian Ocean in the age of empire’, Ulrike Kirchberger explores the collision of different timescales on environmental exchange. Her work considers such factors as the lifespan of different species and their ecological requirements and sets these against the short-term demands of empires, the long-term thinking of conservationists and the impacts of differing transportation modes and species behaviours. She also examines the manner in which different groups of conservationists enlisted the deep time of particular species and groups, as well as projections of future resource demands, in their consideration of which species to introduce, how and where.

Call for papers

I particularly encourage submissions on topics related to history and energy, the atmosphere and water, especially in relation to Africa, South America and Asia. Please also contact me if you are interested in guest editing a special issue.

Acknowledgements

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grateful to the journal’s Associate Editors and supportive and active Editorial Board for permitting me to test ideas and share material with them. Finally, I acknowledge the assiduous copyediting of Dr Austin Gee.

James Beattie, Editor,
Dunedin, April 2020
AMERICAN VINES, EUROPEAN POTATOES: AN EVOLUTIONARY HISTORY OF EUROPEAN MIGRATIONS IN SOUTHERN BRAZIL

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Abstract
In this article we examine the migratory history of German and Italian communities in the southernmost Brazilian state of Rio Grande do Sul. In particular, we explore the divergent trajectories of these two communities in terms of agricultural practices, knowledge, environmental adaptation/transfers and agricultural policies. Adopting the critical tools of evolutionary history, we explore these experiences from a perspective that traditional historical analyses have often neglected. While both Germans and Italians were influenced by a cultural heritage from their homelands, non-European plant species such as the Isabella grape and white potatoes played an essential role in the successful migratory effort of these communities, actively interacting with their knowledge and values. In this sense, we argue for the potentially enriching critical perspective posed by an approach to the environmental history of migrations informed by the critical tools of evolutionary history, complementing the anthropocentric narratives produced by this academic field thus far.

Keywords: environmental history of migrations, evolutionary history, Latin American history, wine, grape vines, potato crops

The nineteenth century was an important period for the consolidation of the Brazilian state, just as much as for most countries that emerged from the dissolution of Iberian colonialism. Aside from British Guiana, Brazil was the only monarchy in South America, and it comprised a vast territory traversed by several ecological zones placed mostly within tropical latitudes. Along the borders of the empire, neighbouring countries flexed their muscles, and frontiers in Latin America were anything but fixed. Internally, separatism was an option for many; fuelled by
the former and fragmented structures of the colonial age, and under the political context of Pedro I’s abdication in favour of his young heir Pedro II, regional revolts broke out between 1835 and 1845 in almost every region of the vast tropical empire.

In the southernmost province of the country, Rio Grande do Sul, the Revolução Farroupilha found support in the post-independence geopolitics of the southern cone. The Argentine Confederation exerted influence over the ambitious provincial elites, whose prosperity depended on the success of the cattle ranching economy and military prestige.¹

Internal and external pressures demanded vigorous action from the court in Rio de Janeiro and, notwithstanding dynastic politics, political struggles among conservatives, moderate and radical liberals, and the respective topic of decentralisation/centralisation, migration emerged as a possible solution to bring stability to the monarchy.² That was exactly the frame for Pedro II’s reign (1841–89). Most of the events related in this paper took place in this period.

On the other hand, migration policies in nineteenth-century Brazil cannot be comprehended without a mention of the slavery question. That was not a simple national issue; British pressure over the abolition of slavery—often reputed to be the very base of Brazilian political unity—piled up additional unease among the political class and the elite.³ In most parts of the country, European immigrants were destined to sustain the monocultural activities at the core of the Brazilian national economy, mainly coffee plantations situated in the states that were experiencing unprecedented economic growth, becoming the socioeconomic and political centre of the country—such as the states of São Paulo and Minas Gerais.⁴ European settlers were therefore forced to confront working conditions of massive exploitation that became regarded as ‘camouflaged slavery’ and determined the abrupt termination of migratory flows from Germany and other northern European countries, favouring a massive migratory wave from Italy.⁵ However, in the case of Rio Grande do Sul, the migratory phenomenon became known as colonização (colonisation), as it did not simply consist in importing a labour force from other countries, but in creating new settlements based on small-scale property regimes quite unconventional for a slavery-centred plantation economy such as Brazil’s.⁶

³  Stefan Rinke, Revolutionen in Lateinamerika: Wege in die Unabhängigkeit 1760–1830 (Munich: Beck, 2010), 286.
⁴  Beatriz Maria Lazzari, Imigração e ideologia. Reação do Parlamento brasileiro à política de colonização e imigração (Caxias do Sul: UCS, 1980), 15.
In 1824, Germans arrived in Rio Grande do Sul as imported *Wehrbauern*, replicating military-civil strategies used by the Habsburg and Russian Empires against the Ottomans. German migration would be a lasting phenomenon for the next several decades, up to the twentieth century. About 50 years later, Italians came and settled on the uplands of the province. Since then, Germans and Italians have shaped the landscapes of the entire region, at times trespassing provincial and even national borders. The colonisation of the Mata Atlântica biome and the establishment of agricultural settlements were then the common ground of both experiences.

Adopting slash-and-burn cultivation, Germans and Italians expanded the agricultural frontiers of the empire according to particular developments. Italians, at least in appearance, resorted to the traditional agricultural practices characterising their homeland, implementing agricultural practices based on vineyards and wheat cultivation. Conversely, Germans followed local precedents and emphasised native tropical crops, although not exclusively. Both groups of people had to learn a lot from local Brazilian cultivators, who helped them make sense of the new environments they were managing. Overall, migration, subtropical forests and agriculture formed a hotspot for environmental globalisation in southern Brazil.

In this article, we attempt to reconstruct the divergent trajectories of German and Italian migrations in the southernmost state of Brazil (Rio Grande do Sul), with particular emphasis on the ecological transformations related to this experience. Employing the critical lenses of environmental history, we look at the intermingling of the homeland culture of these two migratory groups with local environmental knowledge and a vibrant foreign territory that presented different ecological characteristics for these groups. We explore these issues by examining two specific crops in the making of these two different groups—respectively, potatoes for the Germans and grape growing for the Italians. Eschewing an anthropocentric approach

8 The idea of ‘homeland’ is here utilised in a non-literal sense, considering that both Italy and Germany were unified during this migratory experience (respectively in 1861–71 and 1871). Indeed, German immigrants arrived in Southern Brazil during the 1820s, well before German unification, while Italians came a few decades later, although they rarely identified with their homeland but rather with the region and/or the municipality from which they came. However, although the concept of homeland assumes a rather abstract connotation when looking at the trajectory of these groups, common cultural instances and unitary political designs had already been developed in both countries. At the same time, the migratory experience produced a sense of belonging to the motherland in both communities, who started looking at the European lands that they had left as a major cultural reference in order to differentiate themselves from other immigrant communities. For all the reasons above, in this article we have decided to adopt the term ‘Germans’ and ‘Italians’ in order to define these communities. For a brief argument on the identity of both German and Italian immigrants, see Olívio Manfroi, *A colonização italiana no Rio Grande do Sul. Implicações econômicas, políticas e culturais* [first published 1975] (Porto Alegre: EST Edições, 2001); Sílvio Marcus de Souza Correa, *Zur ethnischen identität der deutschstämmigen in Santa Cruz do Sul / Brasilien* (Santa Cruz do Sul: Unisc, 2001).
to the migratory history of southern Brazil, we propose a critical view of these migratory processes that stems from evolutionary history and neo-materialism.\textsuperscript{10} If German and Italian settlement experiences were informed by cultural knowledge exported from their homelands, then it would be anticipated that their migratory history was influenced by their encounter with natural species that travelled from other parts of the world and whose biological and genetic characteristics allowed them to thrive in the southern Brazilian environment.

**Co-evolutionary migrations**

This study is informed by research documenting the ecological expansion of humankind since the late fifteenth century, as well as by more recent studies assessing the relation between environmental change and migration in several regions of the world between the late nineteenth and early twentieth centuries.\textsuperscript{11} Perhaps more importantly, this article attempts to look at migratory flows in history as organic phenomena in which the dichotomy between natural and social factors disappears, falling into the larger domain of ecological change.\textsuperscript{12} This aim is accomplished by adopting the critical tools provided by evolutionary history and neo-materialism, attempting to address the role of non-human actors in the construction of the ecological niche that these two European groups still occupy to this day. In this sense, following the perspective of environmental history, the successful migratory experience of these European communities in southern Brazil should not be considered only as a colonisation experience aimed at conquering the national ecological frontier and informed by an expansionist political and economic agenda. Rather, this phenomenon should be understood as a co-evolutionary process that led two different human groups from overseas to adapt to an ecosystem that presented several differences from their homelands. This process of encounter created a hybrid landscape in which traditional practices from the cultures of the two countries of origin intermingled with the material characteristics of the local ecosystem.


\textsuperscript{12} See Armiero and Tucker, *Modern Migrations*, 5.
This contested and epistemic process was caused by the concurrence of multiple factors. While the persistence and self-reliance of these communities was essential for the success of this daring enterprise, traditional indigenous knowledge and the unique biodiversity of the region were essential for their survival, especially in the initial stages. However, as Germans and Italians began to establish themselves in the region, they developed agricultural practices that allowed the economy of their colonies to thrive with the establishment of industrial activities based on intensive agricultural production and traditional craftsmanship. Naturally, this process has determined large-scale environmental transformations, accelerating the destruction of the Atlantic rainforest in favour of the anthropic landscapes that still characterise the region these days.

In this article, we maintain that this process was not only a response to these communities’ will to reproduce the circumstances of their homeland. The industrialisation of agriculture in southern Brazil also responded to a political agenda of assimilation promoted by the Brazilian state all over the southern ecological frontier between the late nineteenth and early twentieth centuries, one that transformed these immigrant groups into one of the symbols of the national narrative of ordem e progresso. Perhaps more importantly, the successful experience of German and Italian immigrants in southern Brazil was facilitated by the characteristics of other biological species that favoured the construction of the ecological niches in which these communities could survive and thrive. Italian immigrants found in wine production a successful enterprise thanks to a foreign plant known as Isabella whose biological characteristics were suitable for local ecologies. Conversely, Germans were able to ‘re-Americanise’ tobacco and potatoes—both crops originally native to the Americas and therefore particularly suitable for the local environment. In southern Brazil, after their introduction from Europe, varieties of ‘European’ potato were extremely successful in Rio Grande do Sul, while ‘Prussian’ tobacco successfully reached the fields of the German colonists.

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Migration and environmental adaptation

Figure 1: Municipalities of German and Italian colonisation in Rio Grande do Sul. 
Source: Adapted from Helena Brum Neto, Regiões culturais: a construção de identidades culturais no Rio Grande do Sul e sua manifestação na paisagem gaúcha (Santa Maria: Universidade Federal de Santa Maria, 2007).

Germans

The foundation of the colony São Leopoldo (1824) marked the beginning of German immigration in Brazil. To be fair, Germans had written since the sixteenth century important pages of Brazilian history through the deeds of people such as Mestre Johan, Hans Staden and Wilhelm Ludwig von Eschwege.\textsuperscript{15} Settlements of German-speaking colonists had been created in 1818 in Nova Friburgo (Rio de Janeiro) and Leopoldina-Frankenthal (Bahia), with disappointing results.\textsuperscript{16} However, none of these previous experiences could match the weight of São Leopoldo for Brazilian-German history. Between 1824 and 1830, 5,000 Germans were shipped

\textsuperscript{15} Luiz Alberto Moniz-Bandeira, Wachstumsmarkt Brasilien: Der deutsche Wirtschafts- und Handelsbeitrag in Geschichte und Gegenwart (Wiesbaden: Springer Fachmedien, 2013), 2–3, doi.org/10.1007/978-3-658-02202-0.

to Brazil, mostly to São Leopoldo, but also other colonies in Rio Grande do Sul (Três Forquilhas and São Pedro de Alcântara das Torres). Other southern provinces (Santa Catarina and Paraná) received colonists as well. Most migrants came as Wehrbauern, working the land and integrating at the same time into the first battalion of foreigners in the Imperial Brazilian Army. They came from the German states along the Rhine, including Rhenish Prussia (Rheinland), the Bavarian Palatinate and Baden, but also from Mecklenburg and the Hanseatic cities of Hamburg and Bremen. Between 1844 and 1874, this community grew all over Brazil, as national and provincial legislation was implemented in order to increase migratory flows in concurrence with the gradual abolition of slavery. A total of 17,000 Germans arrived in the province, mostly—and again—from the states along the Rhine, Saxony, Hanover and from the eastern Prussian province of Pomerania. While several colonies were created in different states, Rio Grande do Sul consolidated its status as the cradle of German immigration in the country, with the foundation of colonies such as Santa Cruz (1851), Conventos (1855), Nova Petrópolis (1858) and Teutonia (1858), among others. While about 50,000 people moved to Brazil during three subsequent migratory waves (1874–89; 1889–1914; 1914–39), the first two migratory waves described above constituted the core of German migration analysed in this paper. As this process coincided with the political unification of the German state (1871), colonos in southern Brazil were targeted by nationalist discourses of ‘Germanness’ (Deutschtum) and measures of ethnic solidarity taken by churches, societies and individuals could be perceived.

German migration in southern Brazil obeyed climatic considerations as well. In fact, São Leopoldo and the other colonies that were established during this time in subtropical latitudes supposedly confirmed theories that supported the later discourse of human health attached to tropicality. In line with the climatology of the time, proponents of German migration to Brazil such as Oscar Cannstatt and Traugott Bromme emphasised that Europeans might not be suited to living in the tropics, claiming German settlements north of Rio de Janeiro were impossible. The Eurocentric notion of ‘neo-Europes’ seemed to have met Rio Grande do Sul inasmuch as the southernmost province of the empire was able to support a denser contingent of temperate migrants.

17 Olgário Paulo Vogt, A colonização alemã no Rio Grande do Sul e o capital social (Santa Cruz do Sul: UNISC, 2006).
21 Crosby, Ecological Imperialism, 206.
Overall, German rural migration in southern Brazil meant forest colonisation. Up to the 1850s, central European agriculture relied heavily on forest resources, and therefore colonists were able to incorporate the woods into their agrarian cycle in South America. However, the Atlantic rainforest was commonly perceived as a sort of environmental otherness, demanding precise technologies, knowledge and practices for its management. Thanks to an ever-growing media landscape in the German states, new graphic technologies, vibrant commercial bonds between Brazil and the different parts of Germany, and growing rates of literacy among the lower strata of German society, broader layers of the German public could access information regarding the environmental conditions of agricultural production in Rio Grande do Sul. Moreover, the intense exchange of migrant experiences through letters and the onset of a nationalism of global scope permitted augmented knowledge and power over southern Brazilian landscapes as well. Broadly speaking, a polycentric cultural zone had formed, claiming that Germans should choose deciduous/semi-deciduous forests to colonise, avoiding grasslands and pine forests that covered the northern uplands. Moreover, slash-and-burn cultivation was resorted to as the solution for converting the so-called Urwald (primeval forest) into arable. Local farmers, Indians, state officials, businessmen, clergy and other actors contributed to the diminishing of the blanks in knowledge as well.

The category of ‘subtropical climate’ played a pivotal role in attracting the first agriculturists among the Germans in Rio Grande do Sul. One of the most noted traits of local weather was the possibility of extending their known agricultural calendar. In comparison to the northern and western German-speaking lands—whose agriculture in the nineteenth century was limited, respectively, to 150 and 200 days per year—Rio Grande do Sul admitted a virtually limitless cultivation due to the seasons, temperature, precipitation and photoperiodic patterns. However, distinctions between a humid/cold wintertime and a relatively dry/warm summertime shaped the progress of agricultural practices. Slash-and-burn cultivation was more efficient after the cold and more humid season, and from September to late October, colonists used to cut the forests and bushes; after some weeks of dry and warm weather, the biomass displaced onto the soil, along with fallen leaves (forest litter) produced by subtropical deciduous trees, could then receive the nourishing flames. The local climate also became responsible for altering the European pattern of summer and winter cereals (Sommergetreide and Wintergetreide, respectively); Rio Grande do Sul allowed only a single harvest of wheat, rye, oats or barley per year, demanding the cultivation of other crops.

Italians

As for the Italians, over about a 30-year period, from 1875 to 1914, between 80,000 and 100,000 Italian immigrants, to this day known as Italian gringos, came to the southern region of Brazil.\textsuperscript{25} They mainly occupied a large upland territory measuring about 5,000 km$^2$ located in the north-eastern part of the state of Rio Grande do Sul, about 100 km north of the capital city of Porto Alegre.\textsuperscript{26} The majority of Italian families that settled on the uplands of Rio Grande do Sul came indeed from densely populated mountain areas in the northern regions of the Veneto (54 per cent) and Lombardy (33 per cent) and gladly migrated away from a piece-rate work system to the promise of small land ownership.\textsuperscript{27} In a relatively short amount of time, 84 independent districts were created, today divided into 55 municipalities.\textsuperscript{28} Yet, the so-called Serra Gaúcha was far from being an urbanised territory. Sitting on the north-eastern part of Rio Grande do Sul between the River Antas to the north and the German settlements situated on the deltas of the rivers Taquarí and Caí, this upland territory possesses unique geographical characteristics for a mainly tropical and subtropical territory such as Brazil. The entire colonial zone was situated on the southern part of the so-called Paraná Plateau, a high tabular upland composed of sedimentary rocks covered by a diabase layer, reaching over 1,200 m in height. As a consequence, climatic patterns in the region are quite unusual for Brazil, presenting hot summers, but also cold winters with frost and snow.\textsuperscript{29}

Until the early 1870s, this upland territory was almost entirely occupied by forests—respectively, subtropical rainforest at lower altitudes (300 m to 500 m), and wild pine forests starting from 500 m altitude and reaching peaks of 900 m.\textsuperscript{30} Climatic conditions were harsher than the rest of the country, characterised by hot, dry summers and cold winters, with an annual average precipitation rate of 1,400 mm.\textsuperscript{31} These environmental characteristics contributed to create an image of this upland region as a pristine wildlife territory, or sertão—literally, 'desert'. Local and national

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\textsuperscript{25} While in other Latin American countries, this term is adopted in order to address foreigners from the United States, in Brazil it indicates foreigners in general. In southern Brazil, given the relatively late migratory wave from Europe, some of these communities are still ironically defined as gringos, especially in the Italian upland territories. For further information see René Ernani, ‘Gertz “Gringos” e “alemaos” no Rio Grande do Sul’, in Roberto Râdînû and Valeria Beatriz Merlotti Herédia, \textit{Imigração e sociedade: Fontes e acervos da imigração italiana no Brasil} (Caxias do Sul: EDUCS, 2015), 206–31, and Luis Alberto De Boni and Rovilio Costa, \textit{Os Italianos do Rio Grande do Sul} (Caxias do Sul: UCS [1979] 1984), 68.


\textsuperscript{29} Falcão Vieira, \textit{Geografia}, 70–1.


institutions paid little attention to the various indigenous groups of Kaingang and Xokleng who already inhabited the region. They envisioned developmental policies for the reconversion of the area to industrial agriculture, with the aim of increasing national revenues.  

Certainly, their predominantly mountainous origin constituted a strategic advantage for the Italian families who had to settle in the hostile environment of the Serra Gaucha. Nevertheless, adapting to local ecological circumstances remained quite a complex feat in a region that could be considered a full-fledged geographical island. Italian mountaineers had to immerse themselves into a foreign forest environment, marching for several days along narrow paths in order to reach the mountain peaks and rugged valleys in which were the land plots that the government had allotted them. Italian settlers had to create ideal conditions for their permanent subsistence, while confronting the ecological competition of local indigenous groups and dangerous wild animals, such as wild boars, ocelots and cobras. Therefore, in the first migratory stage, neither economic progress nor productivity were the main concerns for the Italian settlers, unfamiliar as they were with such a vast forest environment, especially in comparison with the densely populated hamlets that they inhabited in northern Italy.

In this context of hardship and deprivation, during their first migratory stage Italian immigrants looked more like guinea pigs in the Brazilian government’s plan to bring ‘civilisation’ to the land, rather than skilful pioneers—a common pattern that the environmental history of migrations has started to unveil. Whilst the success of Italian communities partially relied on a cultural heritage that informed and motivated their everyday modernising efforts, other exogenous factors would play an essential role in the survival of these staunch gringos. In fact, during the first settlement period, Italian immigrants mainly relied upon a system of subsistence agriculture practised on their own land lots and inspired by traditional practices devised by Kaingang tribes.

Local indigenous communities had inhabited the land for millennia, developing a lifestyle that relied on hunter-gathering practices associated with the ecological peculiarities of the local forest, and on the establishment of mechanisms of environmental control based on collective action. Among these, a typical activity was slash-and-burn agriculture—namely, the clearing and fertilisation of forest

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32 Azevedo, Italianos e Gaúchos, 22.
33 Bunse, O vinhateiro, 45.
34 Azevedo, Italianos e Gaúchos, 101.
37 Armiero and Tucker, Modern Migrations, 8.
38 Manfroi, A colonização, 98.
American vines, European potatoes

This system resulted in the complete fragmentation and diversification of agricultural production in the region, as each family practised subsistence agriculture in its own lot. An account of 1877 edited by the Ministry of Agriculture reported on the cultivation of several native crops furnished by local authorities in the settlements of Conde d’Eu and Dona Isabel, today pivotal urban areas of the region, known respectively as Garibaldi and Bento Gonçalves. These included the cultivation of crops such as corn, tobacco, potatoes, sugar cane, manioc root and beans. Therefore, unlike the rest of Rio Grande do Sul, in the Italian colonial zone migratory processes were accompanied by the development of polyculture, rather than monoculture. Agricultural development varied according to the seasons and the altitude of the territory. These basic forms of agriculture were also complemented by hunter-gathering practices traditional to the indigenous people inhabiting the territory. These relied on the rich biodiversity of the local forest (known as mixed Bryophyllum forest), uniting semi-deciduous and evergreen species. In particular, the ancient coniferous trees known as araucaria constituted a major source of protein intake for early settlers. Suitable to grow in the poor soils of the Southern Brazilian uplands, these trees produce extremely nutritious fruits—known as pinhões—that are harvested during the winter.

As small-scale subsistence agriculture started bearing fruit, it became interrelated by practices of animal farming, as different plant species were associated with certain types of cattle, normally European-born breeds that had been brought to the region by Portuguese and German colonisers. As an example, hay was associated with cows, and corn with pigs and chickens, which in turn provided a resourceful supply of animal proteins and dairy products for local farmers. Just like in the case of German settlers, in the north-eastern uplands of Rio Grande do Sul, this process was facilitated by national and local institutions that provided Italian families with seeds and tools, especially during the first migratory period, from 1875 to 1889. Local settlers were assigned small land plots ranging between 30 and 60 hectares, which they were supposed to redeem within five years using agricultural revenues.

Yet, in contrast with the German case, the first years of Italian colonisation were characterised by the substantial difficulty of increasing agrarian revenues beyond the threshold of subsistence. According to the local newspaper O Caxiense, the reason for these difficulties lay in the lack of experience of Italian communities,
former pieceworkers who did not possess adequate resources with which to improve agricultural revenue.\textsuperscript{49} The lack of agricultural skill among Italian immigrants reported in this article is confirmed by a two specialised columns that ran between 1909 and 1910 in the local newspaper \textit{La Libertà}, containing basic notions of agricultural production for local inhabitants.\textsuperscript{50} Poor agricultural production was also a consequence of the ecological characteristics of the territory: with its rugged geography, alternating hillside areas and tabular hilltop, the highest soils of the \textit{Serra Gaucha} experienced poor drainage, and their basaltic composition did not favour the absorption of rainwater.\textsuperscript{51} Water supply was indeed one of the main issues for Italian migrants, who sometimes had to walk for an entire kilometre in search for drinkable water. At the same time, lower soils possessed high degrees of acidity and large amounts of iron compounds, and as a consequence were easily subject to erosion. Finally, a high degree of climate variability affected the entire region, characterised by sudden heavy rains, fog, frosts and hail, as well as violent temperature variations during the day.\textsuperscript{52} All these elements constituted dramatic risk factors for agricultural production in the region in the early settlement years, as farmers had to learn to contend with unpredictable environmental factors.\textsuperscript{53} Therefore, while the rudimentary practices of slash and burn could not accommodate the needs of a growing community of ambitious settlers in search of a better life, the system of private land ownership enforced by the Brazilian national government did not necessarily take into account the delicate hydrogeological balance of the territory, and the unprecedented demographic pressure put a strain on the region.\textsuperscript{54}

While slash-and-burn practices had allowed Italian immigrants to survive during their early settlement stage, the environmental threat posed by deforestation and the problems with agricultural production constituted major concerns for Italian colonisers.\textsuperscript{55} As the native forest disappeared and demographic pressure increased in the region, Italian families were confronted with the challenge to devise alternative productive activities that would ensure subsistence while addressing arising ecological issues.\textsuperscript{56} If the socioenvironmental challenges faced by Italian

\textsuperscript{49} \textit{O Caxiense} 1, no. 2 (1897).
\textsuperscript{50} These were entitled ‘Notions of Modern Agriculture’ and ‘Section of the Colonos’. For more information, see \textit{La Libertà} 1, nos 1–59 (1909–10).
\textsuperscript{53} Rothwell, \textit{The old Italian colonial zone}, 29–33.
\textsuperscript{55} These concerns were documented by the Italian Consul, Umberto Ancarani, in 1905, who questioned the future resilience of the colonial zone and foresaw a socioenvironmental crisis. For further information, see Umberto Ancarani, ‘La Colonia Italiana di Caxias’ (Ministero degli affari esteri, bollettino dell’emigrazione, 19) (Rome: Tipografia Nazionale Bertero, 1905), 12–13.
immigrants were therefore much more critical in contrast to their German peers, both communities seemed to struggle to find an ideal form of land use during their early migratory stage. In both cases, the German and Italian communities embraced one of two crops whose genetic characteristics allowed them to thrive in the colonial zones that they had been assigned—respectively, potatoes for Germans and vines for Italians. Ironically, while these two species reminded German and Italian immigrant communities about their respective homelands, in both cases they were originally ‘American’ crops that these two European groups contributed to popularising on the Southern American rim of the Atlantic.\footnote{Even though vines are obviously not originally American, the specific variety that Italian communities in southern Brazil successfully harvested is \textit{Vitis labrusca}, most particularly the Isabella grape variety, a variety first selected in the United States.}

The ‘re-Americanisation’ of potatoes

In comparison to the agricultural patterns proposed by subsequent migratory groups, Germans implemented a more \textit{native} agriculture. The adoption of local crops came notwithstanding efforts in transplanting the agronomic repertoire of central European agriculture to southern Brazil. However, by the time German \textit{colonos} settled in Rio Grande do Sul, differences between supposedly native and exotic crops had lost their absolute connotation, inasmuch as German agriculture had already adopted crops from the New World since the seventeenth century.\footnote{Hans-Heinrich Müller, ‘Domänen und Domänenpächter in Brandenburg–Preußen’, in \textit{Moderne preußische Geschichte, 1648–1947. Eine Anthologie}, ed. Otto Büsch and Wolfgang Neugebauer (Berlin and New York: De Gruyter, 2013), 321–3.}

The most emblematic crop in this sense was the potato: originally domesticated in the Andean highlands, it entered Europe during the sixteenth century. In the former German states, the arrival of this crop has been attributed to Charles de l’Écluse or Carolus Clusius de Antwerp (1526–1609), a Renaissance botanist who introduced the plant to his fellow court gardeners in Germany.\footnote{Ellen Messer, ‘Potatoes (White)’, in \textit{The Cambridge world history of food}, ed. K. F. Kiple and K. C. Ornelas (Cambridge and New York: Cambridge University Press, 2000), 190–1, doi.org/10.1017/CHOL9780521402149.023.}

In the following centuries, the prestige and acceptance of the potato would grow considerably in the German-speaking lands. It even became a geopolitical tool as the Prussian state promulgated the \textit{Kartoffeledikt von Potsdam} (1756) with the aim to improve the nutrition of soldiers and preventing the complete destruction of cultivated fields during times of warfare.\footnote{Hartmut Harnisch, ‘Peasants and markets: The background to the agrarian reforms in feudal Prussia East of the Elbe, 1760–1807’, in \textit{The German peasantry: Conflict and community in rural society from the eighteenth to the twentieth centuries}, ed. R. J. Evans and W. R. Lee (London: Croom Helm, 1986), 64–7.
The potato became a pivotal element of the Agrarian Revolution between the eighteenth and nineteenth centuries, since its cultivation permitted the development of crop rotation and the intensification of agriculture and husbandry. Potatoes pushed productivity higher as long as they were cultivated in areas that used to be left fallow—according to long-established practices related to the three-field system. With the intensification of land, livestock farming and fertilisation, the spread of potato fields throughout fallow land followed synchronically the development of barn facilities among peasants and farmers. The surplus in the field was then channelled to the stables and provided an additional source of calories for the livestock. Cattle, for instance, could produce more manure than the usual quantities, with the advantage of sedimentation of the dung in a concentrated place, allowing further and more accurate fertilisation of the fields. Such measures formed the core of the so-called rational agriculture as proposed by Albrecht Thaer (1752–1828), who combined expertise in natural sciences and an international reputation with concrete agrarian policies under the Prussian monarchy. Potatoes also became a cheap source of food for an agrarian society that still had to endure famines and multiple hazards. Besides that, the tuber changed eating habits from Ireland to Russia, transforming food traditions markedly.

By 1824, Germans had already mastered the cultivation of potatoes in former farmland that had been abandoned because of loss of fertility. Eastern Germans were presumably more accustomed to its cultivation, because crop rotation was generally accepted earlier and more easily by the aristocratic and commercial agriculture of the region. Western Germans, and especially the migrants from the Hunsrück and Eifel regions—both of them part of the Prussian Rhineland—were still shifting towards crop rotation. There, potatoes were only cultivated in some tracts of fallow lands, which were not completely abandoned up to the end of the nineteenth century. Nevertheless, Johann Nepomuk von Schwerz, Albrecht Thaer’s close collaborator, observed in 1831 during a research survey across the Hunsrück that peasants foddered their livestock with both raw and cooked potatoes.
The arrival of Germans in southern Brazil may be seen as a process of re-Americanising of the potato, at least in terms of South America. This historical process implied the introduction of European-cultivated seedlings/tubers in the continent where potatoes are deemed to be native. Furthermore, the potatoes brought by the Germans into southern Brazil in the nineteenth century were by no means equal to the ones dispersed by the Columbian Exchange inasmuch as centuries/decades of cultivation in European fields had exposed potatoes to different evolutionary processes. Quite interestingly, in the early nineteenth century the Andean tuber was strikingly unusual for most of Brazilian society and neighbouring countries—but still pivotal in the Andean altiplano. While indigenous groups like the Kaingang, Xokleng and Guarani still cultivated some potato species such as white potatoes (*Solanum tuberosum*) and the *batatinha* (*Oxalis* spp. and *Canna glauca*), such production was carried out only on a local scale. Moreover, these territories were often located far from urban settlements and therefore unreachable for broader markets. In addition, cassava (*Manihot esculenta*) was the most prominent crop of indigenous forest agriculture, leaving potatoes far behind in terms of gross production. It comes as no surprise that prior to German migration, urban residents in Brazil had access to the potato only through imports from Great Britain; as a reflection of this, the regular potato is still called *Batata inglesa* in Brazil. From the 1850s, the German colonies of São Leopoldo and Santa Cruz were responsible for 95 per cent of the potatoes consumed in the biggest cities of Rio Grande do Sul. The prominence of the Germans in dealing with the potato and their dominance of local, national and even international markets contributed to the formation of imagined ethnic frontiers posited by travellers like the physician from Lübeck Robert Avé-Lallemant. In the late 1850s, he went so far as to emphasise the inner identity between potato cultivation and Germanness in Rio Grande do Sul. Moreover, Brazilian nationals very soon nicknamed and labelled Germans with the term *alemão-batata*, literally ‘potato-German’.

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68 By 1854, there were 186 varieties of potato in the German states. See John Reader, *Potato: A History of the Propitious Esculent* (New Haven, CT: Yale University Press, 2009), 217.


Potatoes became a key element in terms of agrarian knowledge between Germany and Brazil as well. Knowledge of the potato operated as a translator for exotic and unknown tuber crops like the cará (*Dioscorea alata* or purple yam) and the white yam (*Dioscorea cayennensis* subsp. *rotundata*) inasmuch as books, brochures and other text formats presented their similarities with the potato; but no other tuber was more often compared to the Andean crop than the cassava—Friedrich Gerstäcker and Georg Anton von Schäffer, reputed authors on Brazilian affairs in the German states, claimed such proximities clearly and emphatically. In the long term, cassava and potatoes came to dominate colonists’ gastronomic taste; however, despite having displaced the potato in some European recipes, cassava coexisted on relatively equal terms with the potato in German-Brazilian rural society. Perhaps more importantly, German colonists in São Leopoldo could dispose of potato staples as soon as 1824. Under the influence of von Schäffer—at the time in charge of recruiting colonists in Europe for São Leopoldo and deeply aware of the pivotal role played by the potato in central European agriculture—the imperial government supplied the newcomers with the precious tubers.

In Rio Grande do Sul, potato cultivation developed satisfactorily, following a shared global sense that its cultivation was more likely to be successful outside tropical latitudes. In contrast to Prussia, for instance, the climate of southern Brazil enabled on average two harvests per year. The most acute differences in terms of agrarian practices happened when colonists were pioneering new and forested areas, because stumps, logs and roots prevented for some years the usage of the plough and the harrow even after deforestation and burning; in addition, land clearance used to occur with limited inputs of manure, since German pioneers normally did not possess enough livestock for composting the soil; however, that could be compensated for by slash-and-burn agriculture, which improved the nutrition of the soil and avoided acidification. Letters written by colonists and published in the German-speaking lands in the 1850s reported the harvest of potatoes directly from the forest (*batata silvestre*), a fact that opens new questions about either the likely reutilisation of fields abandoned by indigenous farmers, or the invention of short-lived techniques. Some years after deforestation, German *colonos* often resorted

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76 Carl Friedrich Gustav Seidler, *Dez anos no Brasil: eleições sob Dom Pedro I, dissolução do Legislativo, que redundou no destino das tropas estrangeiras e das colônias alemães no Brasil* (Brasília: Senado Federal, 2003), 169.


80 Alves, ‘Cartas de imigrantes’, 178.
to fertilising the resulting arable lands, with the usage of the plough and harrow. The tuber continued to perform its role as a crop of global scope that grows on volcanic soils because in both central Europe and southern Brazil, the potato was a pivotal character of traditional slash-and-burn agriculture.\textsuperscript{81}

Potato cultivation was also suitable for steep hills, a geophysical reality for many colonists in Rio Grande do Sul.\textsuperscript{82} Yet, more strikingly to the history of biotic acclimatisation, the potato became a buffer crop for agricultural experimentation. German colonisation in southern Brazil demanded above all the ability to face risks; in the pioneering time, cultivating cassava, black beans and local varieties of corn implied managing unknown crops under unpredictable weather conditions. To some extent, German colonists had been trained for the challenge of coping with the environmental otherness of South American ecologies, as mentioned before; the entrusted agent Peter Kleudgen, for instance, wrote a brochure, published in 1853, for the colonists who headed to Santa Cruz stating that the potato ‘delivers an extraordinary production without demanding complicated preparation of the field’.\textsuperscript{83} Potatoes provided—at least in the biggest Germanic colonies of Rio Grande do Sul—welcome reliability because they belonged to a familiar agrarian repertoire, an exception in the whole edifice of German-Brazilian agriculture.\textsuperscript{84} This development could be well observed in the colonies Santa Cruz, São Lourenço and São Leopoldo.

As German colonisation gained pace in the late 1840s, newcomers brought with them new varieties of potato that were juxtaposed with local ones. However, the globalisation of the potato was at that time paying a high price for its poor genetic variability, inasmuch as the effects of the potato blight (\textit{Phytophthora infestans}) were still ravaging production worldwide. Johann Eduard Wappäus identified some diseases existing in the potato in southern Brazil during the early 1850s.\textsuperscript{85} While colonists tried to escape the consequences of the ‘Hungry Forties’ in their homeland, they were possibly bringing sick staples to Rio Grande do Sul.\textsuperscript{86} An anonymous article (possibly written by Peter Kleudgen) entitled ‘Santa Cruz’ and published by the notorious \textit{Allgemeine Auswanderungs-Zeitung} in 1854 prescribed the transportation of staples, for instance.\textsuperscript{87} Karl Kirchoff, a colonist who settled in Santa Cruz in

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\textsuperscript{82} Arione da Silva Pereira et al., \textit{Produção de batata no Rio Grande do Sul} (Circular Técnica, 48) (Pelotas: Embrapa Clima Temperado, 2005).


\textsuperscript{84} Balduíno Rambo, \textit{A fisionomia do Rio Grande do Sul: ensaio de monografia natural} (Porto Alegre: Selbach & Cia, 1956), 311–12.


\textsuperscript{87} \textit{Allgemeine Auswanderungs-Zeitung} 30 (11 March 1854).
the 1850s, declared that his family brought to Brazil staples and seeds of crops with which they were familiar, potatoes among them. In this period, potatoes and diseases were travelling across the ocean and the Brazilian authorities readily perceived the genetic causes of the problem through the idea of lack of variation. Alarmed by plagues affecting cereal production in Rio Grande do Sul since the early 1820s, provincial and imperial officials supplied colonists with new varieties of potato from the 1850s onward.

German migrants in southern Brazil thus took part in the multisided globalisation of the potato. After some centuries of vigorous success in Europe, Brazil could embrace permanently the potato and, furthermore, its own South American biological-genetic heritage. Since the global expansion of the tuber to other geographies from the early colonial age on, Germans faced the challenges of cropping potatoes under different ecological conditions. The thriving cultivation of the tuber in southern Brazil and its incorporation into some sort of German-Brazilian agronomic culture only became possible due to the globalisation of genetic fluxes, varieties and ecologies.

American grapes

While German colonos were able successfully to ‘reintroduce’ potato crops to southern Brazil, reliant on environmental knowledge and ecological practices from their homeland, the transformation of the poor Italian colonial zone into a thriving wine production area was the result of a complex ecological transfer that allowed major environmental and economic transformations in the region. While since the arrival of German immigrants in 1824 the Brazilian government had invested in agricultural development through a generous policy of land distribution, for Italian communities this process was more troubled, due to contradictory policies, a reduced budget and the harsh geographical characteristics of the territory. Geographical isolation also compromised trade for Italian colonos, as they had to confront the competition presented by Germans, whose products could be transported to the coastal city of Porto Alegre with more ease. Moreover, the adoption of slash-
and-burn agricultural techniques on an unprecedented scale was starting to take a toll on the ecology of the region, as the disappearance of the forest generated hydrological problems.

Both historical reconstructions and economic studies have emphasised that Italian immigrants found economic and social redemption in the development of the local wine industry. This successful experience began with small-scale family production, allegedly propelled by the need to revive traditions from the Italian homeland through ‘the spirit of wine’. Production was concentrated on the most densely populated areas of land, situated at an altitude between 600 m and 800 m, and comprising the municipalities of Caxias do Sul, Farroupilha, Garibaldi, Bento Gonçalves and Flores da Cunha. According to the Italian consul Enrico Perrod, as early as 1881, the area of Garibaldi alone had produced 5,000 hectolitres of wine. This was the first step in the proliferation of the local wine industry, as the production of wine was later extended to cooperative organisations and a national labour union of wine producers—known as Sindicato do Vinho—was formed in 1929. The optimisation of the wine industry was supported by technological innovations promoted by national institutions, such as the adoption of small windmills and, later on, of water and vapour machines. Naturally, the success of the local wine industry was also tantamount to the centralisation of the supply chain, as production was concentrated in the hands of a few entrepreneurs who were able to profit from the import substitution policy launched by the national government during the interwar period. Later, during the 1970s, multinationals from France, Italy, Uruguay, Canada and the United States penetrated the Brazilian national market, fostering internal competition and the diversification of the supply chain. Today, bioengineering and modern industrial agricultural techniques have allowed the adaptation of several European species to the local Brazilian climate, fostering a sense of extra-national uniqueness in the local wine industry. According to data from the Brazilian Wine Institute, between 2006 and 2018, the wine industry in the state of Rio Grande do Sul—most of it based in the Italian colonial zone of Serra Gaúcha—has produced an average of 207.6 million litres of table wine and 14 million litres of champagne.

95 Pébayle, ‘Os Viticultores’, 52.
96 Enrico Perrod, Le colonie brasiliane Conte D’Eu e Donna Isabella (Ministero degli affari esteri, bollettino consolare, 19) (Rome: Libreria dei Fratelli Bocca, 1883), 302.
97 Santos, ‘Cantineros’, 140–1.
98 Azvedo, Italianos e Gaúchos, 208.
Economic evaluations aside, historiography agrees in considering the development of the wine industry as the main foundation for a lasting solidarity between the immigrants and the north-eastern uplands of Rio Grande do Sul. Certainly, the development of the wine industry in southern Brazil favoured the resurgence of material practices and cultural features typical of the Italian peninsula. Southern Brazilian vineyards became a cultural tribute to the homeland as well as a great opportunity for socioeconomic growth for a marginal group of individuals that had constructed its ecological niche in a marginal forest territory. However, a more careful examination of the historical data demonstrates that the emergence of viticulture in the Italian colonies was not simply the result of previously acquired environmental knowledge, but also the product of the convergence of historical and ecological circumstances. According to several sources, Italian immigrants brought wine species from Italy, such as Barbera, Bonarda, Moscato and Trebbiano, although they soon realised that they would not adapt to the harsh characteristics of the local territory. In 1905, Umberto Ancarani lamented the scarce acquaintance of Italian colonos with wine production techniques, attributing their failure to cultivate European species to poor environmental knowledge. However, he also observed that the expansion of wine production was fostered by the diffusion in the region of a wine species from North America known as Isabella, a variety that generated a ‘weak, sour and strawberry-flavoured’ quality to the wine.

Allegedly originating in Spain and commonly considered as a hybrid of *Vitis vinifera* and *Vitis labrusca*, the Isabella variety started gaining recognition in the Brooklyn garden of Colonel George Gibbs around 1816, and was renamed after his wife, who had obtained it from North Carolina. An 1846 essay praised it as a particularly adaptive grape variety that could easily be cultivated in non-ideal contexts: ‘it may be placed in a corner of any roof or space which may be desired. It shelters the domestics at their labour, and soap-suds is an excellent manure for its roots. Its qualities are known and respected even among the Vines of Europe’. Between 1839 and 1842, a couple of decades after its diffusion in North America, the plant had been shipped to southern Brazil by Thomas Maister, reaching German immigrants in the regions of Rio dos Sinos and Caí sitting at the foot of Serra...
American vines, European potatoes

*Gaucha.* While the plant had no particular success among German *colonos*, it thrived among Italian communities, who nostalgically embraced familiar wine production as a tribute to their lost heritage.\(^{108}\)

Other ecological factors played a central role in this successful experience. The genetic characteristics of the Isabella—also known as the ‘fox grape’—were particularly suitable for the upland environment of north-eastern Rio Grande do Sul. Due to its environmental and spatial adaptability, the Isabella was very easy to propagate in the rugged territories of the *Serra Gaúcha*. As a deciduous species, it was resistant to the cold winters and climatic imbalances that characterised the region. Perhaps more importantly, its biological qualities allowed it to resist fungal diseases such as oidium and to the plague of phylloxera, a crucial factor in a rudimentary agricultural context such as that of the early Italian colonies.\(^ {109}\) This allowed the massive cultivation of the plant in the Italian region of Rio Grande do Sul, an unprecedented result for a wine species. Indeed, previous attempts to introduce European wine varieties in the country, carried out by the Jesuit missionary St Roque González de Santa Cruz in 1626 and by mariners from the Azores in 1752, had surrendered to the harsh climatic conditions of the region.\(^ {110}\) Thus, although commonly defined as an inferior grape due to its lack of the conventional organoleptic characteristic of *Vitis vinifera* (most notably a low sugar content), the Isabella variety proved suitable for local environmental circumstances, allowing for the expansion of the wine industry in the region.\(^ {111}\) In a few decades from its introduction, the Isabella became officially known as *vinho de colônia*. In 1914, the Italian consul Ranieri Venerosi Pesciolini confirmed the prominence of the Isabella variety in the local wine industry, in spite of the multiple attempts of Italian communities to introduce other European species.\(^ {112}\)

Whilst no other species was as successful as the Isabella, attempts to improve its quality have been made since the 1890s, with the development of hybrids from European seedlings imported by the government of Rio Grande do Sul. Agronomic governmental organisations, such as the *Estação Experimental de Agronomia* and the *Estação Experimental de Viticultura e Enologia*, were also created as a consequence.\(^ {113}\) At the same time, several cooperatives began to be formed from the early 1910s, with the aim to guarantee the overall quality of the product and prevent harmful

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chemical manipulations.\textsuperscript{114} Italian communities were therefore able to bring their traditional affection for viticulture to the north-eastern plateau of Rio Grande do Sul, laying the foundation for a prosperous enterprise that would become the most distinguishing feature of the region. As early as 1884, the diffusion of domestic wine production was already a distinguishing feature of the region, as witnessed by a letter of the Italian immigrant Paulo Rossato, who described in amazement the rapid growth of the vines that were planted in each household in the Italian colony of Caxias do Sul:

\begin{quote}
What they said it’s true: with a small number of vines, they are able to [fill] a large amount of wine barrels. This because they do not plant vines in the fields like in Italy: they plant them next to their houses, using a two metre arbour on which vine branches can grow. In three years time, with only 15 branches they obtain a barrel of good wine. And you cannot imagine how a vine can grow here in three years.\textsuperscript{115}
\end{quote}

In a similar fashion, in 1897 \textit{O Caxiense} envisioned a great year for the harvest and production of wine, describing a ‘luxurious and promising’ vineyard, in spite of the cold winter that had characterised the season.\textsuperscript{116} Certainly, the expansion of the wine industry gave Italian communities a chance to reproduce some of the agrarian patterns that characterised their homeland, although with due differences.\textsuperscript{117} Industrial wine production was aided and complemented by the development of the lumber industry in the states of Rio Grande do Sul and Santa Catarina, leading to the quick exploitation of the precious local tree species, determining a dramatic environmental change that favoured wine crops.\textsuperscript{118} Naturally, this produced major changes in the local landscape: in a few decades the rainforest was replaced by the so-called ‘sacred Mediterranean pair’, consisting of vines and wheat plantations.\textsuperscript{119} Typically Mediterranean tree species were complemented by the proliferation of local vegetation, most notably the so-called \textit{capoeira} shrubs, extensively used during the fallow period after forest clearing, as a result of agricultural rotation techniques.\textsuperscript{120} This produced the meaningfully fragmented proto-Mediterranean landscape that still characterises the uplands of north-eastern Rio Grande do Sul to this day, at the expense of the native forest, of which only 1 per cent survived this transition.\textsuperscript{121}

\begin{footnotes}
\item Pesciolini Venerosi, \textit{Le colonie}, 104–5.
\item In De Boni, \textit{La Mérita}, 31–2 (authors’ translation).
\item \textit{O Caxiense} 1, no. 2 (1897).
\item Frosi and Mioranza, \textit{Imigração}, 94–95.
\item Nodari and Mundstock Xavier, ‘European Immigration’, 47.
\item Rothwell, \textit{The old Italian colonial zone}, 31.
\end{footnotes}
the result of conservation policies aimed at protecting some forest areas, for both aesthetic and practical reasons. Indeed, species such as pines, palms, sycamores and Chinaberry trees (*Melia azedarach*) were used for the construction of houses. The encounter of a foreign species such as Isabella with the Italian viticultural tradition was the spark that ignited the development of vineyards all over the *Serra Gaucha*, a crucial element for the economic prosperity of the region even before the creation of cooperatives and the introduction of mechanised techniques that optimised agricultural production. The introduction of this sturdy wine species, resistant to fungal diseases and to adverse climatic conditions, was a decisive factor for the environmental resilience of the region, whose biological life had been radically modified in just a few decades since the migratory phenomenon. The Isabella allowed Italian *colonos* to recreate a thriving proto-Mediterranean landscape on the ashes of a dying forest biome, thus avoiding a major ecological crisis and the displacement of entire settlements. Not coincidentally, as early as 1914, wine production in the central city of Caxias do Sul was already described in consular reports as the main industry. In this sense, the successful colonial experience of Italian immigrants was more related to the biological characteristics of the Isabella vine plants than to specific environmental knowledge associated with national cultural identity. On the other hand, their affection for viticulture allowed Venetian communities to create a syncretic agricultural experience in a changing upland ecosystem, a wine variety previously selected in North America. This convoluted yet remarkably effective pastiche resulted in the creation of the Italian-Brazilian culture that today uniquely permeates the uplands of north-eastern Rio Grande do Sul, successfully synthesising transnational cultural practices and multi-species ecological features. Certainly, the massive conversion of the territory’s agricultural patterns was part of a national political agenda aimed at increasing the country’s economic revenues by converting allegedly pristine wildlife areas to intensive agriculture. However, this process would have resulted in a major environmental catastrophe had Italian immigrants not stumbled upon this sturdy wine species that would leave an indelible mark on the agrarian characteristics of the region. The experience of wine production would indeed set the tone for the massive conversion of the region to industrial agriculture in the 1970s, with the so-called ‘green revolution’. Thus, what is today known as one of the most Mediterranean environments outside Europe is actually a hybrid landscape, resulting from the syncretic encounter of local species domesticated for centuries by indigenous people and an imported plant species.

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123 Pesciolini Venerosi, *Le colonie*, 44.
Toward an evolutionary history of migrations

Both Germans and Italians faced similar socioenvironmental challenges toward the beginning of their migratory experiences in the southernmost Brazilian (Rio Grande do Sul). Yet, specific cultural inputs from their homelands and the different environmental challenges presented by the geographical regions that they occupied led to divergent migratory trajectories. While both communities relied on slash-and-burn techniques acquired from local indigenous groups in their early migratory period, Germans possessed better cultural tools and more favourable environmental circumstances with which to convert their territory into intensive agriculture without compromising the ecological balance of the region. In contrast, Italians had to confront the harsh environmental circumstances of the Brazilian upland territories with little specific environmental knowledge. This divergence was exacerbated in the following decades, as Germans and Italians engaged in agricultural practices related to two different crops—potatoes and vines, respectively. While the difference between these crops denoted a stark environmental gap between the two colonial regions, they were equally responsible for the successful agricultural experience of both the German and the Italian communities. If during their first migratory stages Italian immigrants almost caused a major socioenvironmental catastrophe for the region, the almost complete destruction of the Atlantic rainforest in the north-eastern uplands of Rio Grande do Sul was compensated by the installation of a pioneer wine species, able to relentlessly thrive on arid soils and to resist the climatic imbalances of the region. The prosperous growth of this sturdy species in the uplands of Serra Gaucha allowed surprised Italian colonos to create a proto-Mediterranean identitarian landscape in the region, symbolically aligned with the traditions of their homeland while at the same time successfully embodying one of the most peculiarly successful examples of Brazilian agricultural entrepreneurship. At the same time, not even the informed German colonos, with their homeland knowledge of environmental conservation, could have foreseen the tremendous impact of potato crops in the colonial zone of Rio Grande do Sul that they occupied. Surely Germans had long been acquainted with potato cultivation in Europe—although between the 1840s and 1850s, the tuber was showing its genetic limits, due to poor variation. Conversely, in Brazil, other varieties could be combined with European ones—along with other environmental features like solar radiation, mild temperatures and precipitation—enabling cultivators to double production. Moreover, the South American origin of the potato and reports about its suitability to southern Brazil turned the potato into sort of a safe buffer for further agricultural experimentalism.

Today both the Italian and the German migratory experience in Rio Grande do Sul constitutes one of the most acclaimed examples of human skilfulness and resilience, as witnessed by the multiple celebratory activities promoted both at a local and at a national level. The myth of the resourceful and skilled European pioneers able to reshape a hostile landscape in their image continues to permeate historical accounts and political discourse. However, a careful examination of the history
of this migration phenomenon, informed by the critical tools of environmental history, reveals a much more complex and controversial picture than that provided by conventional historical accounts.

Challenging the celebratory tone of traditional historical reconstructions, this study has demonstrated that both the development of potato plantations in the German colonial zone and the wine industry in the Italian upland colonies were the result of a multilayered set of historical circumstances in which human and non-human actors intermingled and meaningfully influenced each other. In this sense, the history of European migrations to Brazil described here should be interpreted as the result of a co-evolutionary process in which cultural features, local environmental circumstances and exogenous ecological factors meaningfully intermingled. As these European communities embarked on a migratory journey in a foreign land lying on the other side of the ocean, their homeland culture intermingled with the cultural and ecological circumstances that they encountered in the new territory. Perhaps more importantly, while these communities strove to construct their ecological niche in a foreign environment, they found unexpected allies in other natural species, whose characteristics were particularly suitable for these territories. In the German case, they relied on the potato that had originated in the South American continent and later became a vital means of sustenance all over the European continent. As for the Italians, they found their forte in a traditionally Mediterranean practice such as wine production thanks to a North American variety, particularly suitable in the harsh environment of the Brazilian uplands. The result of this co-evolutionary adaptation journey was the syncretic biocultural experience that still characterises this distinctive region of the world today.

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‘THE MADDING WHEELES OF BRAZEN CHARIOTS RAG’D; DIRE WAS THE NOISE’: MOTORING AND THE ENVIRONMENT IN NEW ZEALAND BEFORE THE SECOND WORLD WAR

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Abstract

The environmental impact of motor vehicles is not a recent phenomenon, it was evident from their earliest years. This was the case in New Zealand, a relatively small though urbanised society, which took up car and motorcycle ownership at a high rate from about 1910 on. This article examines three aspects of the impact of motoring: air, noise and visual pollution. Each was an existing problem to which motor vehicles added a new aspect. As was the case elsewhere, dust diffusion was a greater concern than exhaust emissions in the early decades of the twentieth century. Second, the sound of car horns and vehicle exhausts prompted widespread complaints that fed into a wider international debate on the nature of urban noise and its effect on public health. In addition, traditional social relations were felt to have been upset by antisocial noise. Third, private motoring was blamed for the spread of rural visual pollution since it encouraged roadside advertising. The campaign against billboards revealed much about attitudes towards the picturesque and the commercial use of the countryside. Together with concerns about air and noise pollution, this formed part of a wider early twentieth-century anxiety about the progress of modernity.

Keywords: New Zealand, environment, motor vehicles, cars, motorcycles, pollution, noise, scenery

1 John Milton, *Paradise Lost* (1667), Book 6, lines 210–11.
Introduction

This article explores changing perceptions of how private motoring, both motor cars and motorcycles, affected the environment, not only physically but also audibly and visually. It seeks to avoid the compartmentalisation of motor cars and motorcycles; in the early decades, the term ‘motorist’ was used indiscriminately to mean both a motor car driver and a motorcycle rider. In contrast to cars and their owners, the culture of motorcycling has been little studied. As this article will show, perceptions of the impact of motor vehicles on the environment help undermine the ‘diffusionist’ interpretation of early motoring that has attracted criticism in recent years, not least from the historian Gijs Mom. This sees the United States as the basic model for ‘automobilism’. Developments there, such as the democratisation of car ownership, were followed by European countries with a delay of as much as several decades. Mom argues that, on the contrary, all major motoring conflicts and controversies took place at more or less the same time. The New Zealand experience with regard to the environmental impact of motoring confirms that there was little or no lag, though naturally the scale differed.

While today the impact of motoring on the environment is often seen in terms of emissions and congestion, in its early decades, concerns were different. Dust, noise and visual pollution resulting from the spread of motor vehicles were the main concerns; the fumes they gave off constituted far less of a problem. In cities, early motor vehicles joined a range of other polluting modes of transport: smoke from railways, noxious waste from horses, noise from trams. What attracted the attention of contemporaries was not so much the pollution caused by motor vehicles as what were seen as novel ‘nuisances’. Unmuffled exhausts, for instance, attracted sustained criticism as they intruded in places and times when previously there had been an expectation of relative quiet. As early as 1904, a Canterbury newspaper complained ‘the evil-smelling, evil-sounding machines are becoming an unmitigated nuisance’. Concerns regarding the noise of motor vehicles fitted into an international ‘age-of-noise narrative’ that formed part of a wider early twentieth-century ‘anxiety about the progress of modernity’.

There is a dearth of scholarly study of the impact of early motoring in New Zealand. The principal popular works remain Pam MacLean and Brian Joyce’s The Veteran Years of New Zealand Motoring and John McCrystal’s 100 Years of Motoring in

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3 ibid., 13; Mom excludes Australia from his synthesis: 41n4.
4 ibid., 27.
5 Lyttelton Times (Christchurch), 23 November 1904, 6.
New Zealand. The literature on the impact of motoring and roads on the natural and built environments is in contrast well developed in the United States, for the later twentieth century in particular. It includes, for example, Christopher W. Wells’ *Car Country* and Jane Holtz Kay’s *Asphalt Nation*. John R. Meyer and José A. Gómez-Ibáñez’ *Autos Transit and Cities* looks at the postwar period, while Peter Freund and George Martin’s *The Ecology of the Automobile* considers the sociology of automobility. Ian F. Spellerberg’s *Ecological Effects of Roads* includes some New Zealand examples, but only from recent decades. This article is intended to address and expand upon a subject touched on by Ben Schrader in his important recent work of urban history, *The Big Smoke: New Zealand Cities 1840–1920*.8

Motor cars first appeared in New Zealand in 1898 and from about a decade later became increasingly commonplace. Their numbers grew rapidly, especially from about 1910, when there were approximately 3,500 motor vehicles of all types for a population of almost a million.9 By 1925 there were 71,403 motor cars, or one for every 17 people; a decade later, the ratio had reached one to 11, one of the highest levels of car ownership internationally.10

### Air pollution

Early motor vehicles entered an urban environment that already contained many other sources of air pollution. Virtually all businesses and private homes relied on coal, wood or oil for power and heating. In both urban and rural areas, dust was a significant problem in dry conditions. The dust ‘nuisance’ associated with motor vehicles was a development of an existing problem rather than an entirely new one. Wind-borne dust had been a nuisance from at least the mid-nineteenth century, 

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especially in dry, windy regions such as Canterbury. The dust on urban roads was considered an important hazard to public health as it contained the dried, powdered residue of animal faeces. In the early 1900s, the ‘poisonous bacilli’ it contained were blamed for anything from quinsy to enteric catarrh. Overseas experience primed New Zealanders to anticipate a problem thrown up by the advent of motor vehicles. Horses’ hooves, and the narrow, metal-rimmed wheels of the vehicles they drew, disturbed comparatively little dust. The wider, pneumatic rubber tyres of even the earliest, low-powered cars threw up a great deal more. Initially, the reasons for the difference were a mystery to contemporaries, but experimentation indicated the suction effect of the flexible tyre tread, combined with the movement of air around the car’s bodywork, was responsible. At higher speeds, car tyres sucked out the fine binding material from a macadamised road surface, allowing the coarser metalled surface to break up. Experiments were conducted to find a durable, inexpensive road surface that would withstand motor traffic. Concrete was used in some cases, but the solution eventually adopted on a large scale was to coat the macadam with a layer of tar or bitumen. This meant the road no longer drained well when wet, rendering the surface slippery, especially for horses. In general, throughout this period only the busiest urban roads were sealed in this way. Unsealed roads continued to be watered by local authorities in dry weather to reduce the disturbance of dust. Some discovered that seawater was a more effective binder than fresh water, though the reason was poorly understood.

Passing references to the dust nuisance show it was pervasive, but there was surprisingly little complaint about dust raised by motor vehicles specifically. As was often the case with public controversies, New Zealanders were well aware of developments overseas through the reprinting of reports from newspapers and periodicals, usually British. These heightened public sensitivity to incipient signs of similar problems developing in New Zealand. Early motorists were concerned with dust mainly in so far as it affected them directly. In 1905 an Otago newspaper cycling and motoring columnist declared:

One has only to see [a] big car going along the road to understand why so much fuss is made at Home and on the Continent about the dust nuisance. The cloud of dust raised was blinding, and though it did not affect the occupants very much, it would be decidedly unpleasant, if for anyone to attempt to travel in their rear.

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12 See for example ‘Cycling Notes’, Cromwell Argus, 18 January 1909, 6.
13 Wells, Car Country, 76.
14 See Schrader, The Big Smoke, 394. The situation in American cities was similar: Brian Ladd, Autophobia: Love and Hate in the Automotive Age (Chicago: University of Chicago Press, 2008), 69–70.
Dust on country roads was a major source of complaint in Britain. An English visitor to the antipodean Canterbury in 1909 reassured readers of The Press that ‘the evils of the motor car here are mild compared with the conditions that exist at Home’, where along rural roads infested with the motor cars … it is impossible for the inmates to open doors or windows without having everything in the house covered with a thick coating of dust, while the hedges and garden vegetation appears as though it had been sprayed with Portland cement.

The ‘crops of hay and clover grown on the roadside are becoming valueless owing to their being charged to the dust and grit … Many valuable horses have been lost, and others made seriously ill, owing to having been fed on this dust-charged hay’.16 The Times claimed the reduced numbers of flowers in London parks in the early 1920s was ‘an unexpected result of motor traffic.’ Even powdered horse dung was


Figure 1: ‘The Dust Nuisance—Some Humours from the Cloud’ (detail).
Source: The New Zealand Observer (Auckland), 22 December 1906, 12.
thought preferable to the fine dust generated by tarred road surfaces, which ‘settles on the beds which used to be gay with flowers, chokes mechanically the breathing pores of the leaves, and blights the growth as if it were weed-killer’.17

Nothing as extreme appears to have been experienced in New Zealand, initially at least. A Southland newspaper reported in 1908 that ‘the great bulk of the farmers do not view with any alarm the increasing use and speed of the motor. It is only occasionally, and under great provocation, that they protest against motor traffic’.18 However, some farmers in the vicinity of major towns objected that they ‘get no benefits from the motors, and setting aside the damage they do to the roads, they damage growing crops and hay with dust. It is almost impossible to fatten stock in any paddocks near the main roads, the cars disturb them so much’.19 By the start of 1914, the ‘enormous traffic of motor-cars’ from Wellington was blamed for the ‘deplorable state’ of formerly good arterial roads to the city’s north: ‘Crops growing near the roads throughout Wairarapa are seriously affected with dust due to the motor traffic’.20 Looking back on this period from the early 1930s, one Automobile Association member claimed that farmers who objected to the nuisance of dust clouds, once they acquired a car of their own, ‘changed their attitude about the dust, holding that it did good and helped lighten the heavy soil in some districts’.21

In contrast to the dust they disturbed, the emissions from motor vehicles were rarely considered a problem, except as a potential danger to their owners. Indeed, in the early years so little was known about the nature of motor fumes that they could be seen as a positive health benefit. In 1908, the popular science magazine Progress reprinted the opinion of an unnamed Harley Street specialist that the unpleasant smell of motor exhausts was ‘a blessing in disguise’.

[It] is one of the finest disinfectants going. It clears the air of all germs and impurities. Partially-burnt, carbonised matter is a splendid antiseptic. The creosote vapours which come from a motor car are in reality a health tonic and a brace for the day … It would not do the city man any harm to have several good whiffs of this smell every morning.22

Most, however, were far less sanguine.

Shortly before the First World War, several well-publicised cases spread awareness of the dangers of car exhausts in confined spaces, particularly private garages. The syndrome was briefly named ‘motocide’, but the significance of the colourless,
odourless gas carbon monoxide was not widely recognised until the 1920s.\textsuperscript{23} The dangers of vehicle emissions in large cities overseas were widely reported in the New Zealand press, but with the assurance that there was no danger locally. The vastness of the atmosphere, together with the windiness of most New Zealand cities, was believed sufficient to remove any danger. Complaints in the press about vehicle emissions were not common. One reader, objecting in 1928 to the physical danger, noise and ‘unmitigated nuisance’ of motor cars, added in passing that ‘the pure air is often poisoned by the noxious fumes which are sometimes permitted to pour from the exhaust pipes of this “abominable” invention of modern days’.\textsuperscript{24} Once the danger of carbon monoxide was generally recognised, concerns began to be expressed about the longer-term effects of vehicle emissions. The ‘emission of smothering oil fumes and petrol gases that pollute the atmosphere and pollute human lungs’ led one editorial writer in 1933 ‘to wonder how much longer, and how much more, the atmospheric envelope of the earth can absorb these noxious outpourings’.\textsuperscript{25} No prosecution for excessive emissions is known for this period in New Zealand, though there are examples as early as 1910 for Australia, when a Melbourne motorist appeared in court for allowing ‘an excessive amount of smoke to issue from [his] car’.\textsuperscript{26}

Fuel and oil were obvious sources of environmental pollution, and were subject to well-established municipal government measures controlling dangerous goods. Motor garages, many of which provided parking, stored fuel and oil on their premises, and in the 1920s began to install petrol pumps on the pavements outside. Garage petrol and grease tanks were prone to leak into the sewers, and on occasion the fumes could be strong enough to force even the sewer cleaners out onto the surface.\textsuperscript{27} The Otago branch of the Society for the Prevention of Cruelty to Animals complained that motorists used oily cans to take water from horse troughs and so were contaminating the animals’ drinking water.\textsuperscript{28} The road surface itself could cause environmental harm. Early experiments in England in using coal tar and a solution of calcium sulphate produced ‘evil results’ when ‘the chemicals were washed into the river and poisoned all the fish’.\textsuperscript{29} More than a decade later, the problem had not been

\textsuperscript{23} Though there had been earlier warnings: see McCarthy, ‘The Coming Wonder?’, 56–7; Ladd, Autophobia, 70.
\textsuperscript{25} ‘Noise and Noxious Fumes’, \textit{Northern Advocate}, 28 December 1933, 4.
\textsuperscript{27} See, for example, Boyd, Drainage Engineer, ‘Petrol in Sewers’, 31 January 1923, 1 February 1923. CE2/3/50 1919-28 PAC–PIN. Dunedin City Council Archives.
solved: along country roads, ‘coal-tar oils washed into the streams have poisoned the fish. The effect on vegetation can be seen along the edges of the road where spraying of tar or its hot fumes have killed the herbage’.\(^{30}\) In New Zealand, these fears were eventually dismissed on the grounds that the refining process used locally removed the dangerous chemicals, and in any case ‘the dilution of any possible poison was so complete that the chances of damage to fish life was infinitesimal’.\(^{31}\)

### Unnecessary noise

Urban noise, like dust, was an existing environmental problem to which motor vehicles added a novel component. In this case, however, a small amount of pollution was not easily dismissed. Existing attitudes and expectations were applied to the noise of motor cars and, especially, motorcycles. A distinction was drawn between necessary or unavoidable noises and unnecessary ones. Objectionable noise was in part defined as one that occurred in the wrong time or place—unpredictable rather than predictable. ‘As a matter of fact a noise nuisance is just as real and just as obnoxious as a smoke nuisance, a smell nuisance, or any other abomination’, observed a Hastings newspaper in 1914.\(^{32}\) An apparently short-lived Noise Abatement Society, formed in Auckland in early 1935, gave radio talks on ‘Unnecessary Noise’.\(^{33}\) While it was accepted that industrial and business districts were noisy in daytime, there was a widespread expectation that even cities would be quiet at night, and residential areas quiet at all times. Motor vehicles, especially motorcycles, broke this unwritten rule. As the historian Karin Bijsterveld points out, ‘noise as “unwanted sound” has much in common with dirt as “matter out of place”’.\(^{34}\) The controversy regarding noise entailed wider social assumptions regarding respectability and civility, and attitudes towards the behaviour of the young, especially young men. Bijsterveld further explains that the ‘right to make noise, as well as the right to decide which sounds are allowed or forbidden, has long been the privilege of the powerful’. Young men riding noisy motorcycles late at night upset a ‘deeply-rooted cultural hierarch[y]’, functioning as a ‘symbol of disorder’.\(^{35}\)

\(^{30}\) ‘Flower Beds Ruined by Tarred Roads’, Northern Advocate, 25 April 1921, 1.

\(^{31}\) J. F. Holloway, ‘Tar and Fish’, Evening Post (Wellington), 1 October 1924, 9. It appears that New Zealand roads were not salted in winter, so the problem of run-off polluting groundwater, recognised elsewhere in the 1980s, did not arise. For the United States, see Jane Holtz Kay, Asphalt Nation, 90–1; and John Stilgoe, ‘Roads, Highways, and Ecosystems’, part 5, in The Use of the Land: Perspectives on Stewardship, nationalhumanitiescenter.org/tserve/nattrans/ntuseland/essays/roadse.htm, accessed 12 November 2019.

\(^{32}\) ‘Street Noises’, Hastings Standard, 3 January 1914, 4.

\(^{33}\) Auckland Star, 2 October 1936, 14; see also D. M. Aley, Hon. Secretary, Noise Abatement Society, ‘Noise Abatement: Vigorous Action Needed’, Auckland Star, 1 April 1935, 6.


By the mid-1920s traffic noise, particularly from car horns and motorcycle exhausts, prompted several disquisitions on human perceptions of noise. In one discussion of the topic widely reprinted in the New Zealand press, the Harley Street specialist Leonard Williams argued that a noise, however unpleasant, which is recognised by the subconscious as necessary or inevitable, is immediately accepted and discounted, whereas a noise which is unnecessary or impertinent is rejected by the subconscious and immediately becomes an irritant of the most superlative degree.

While daytime ‘noises are for the most part inevitable … [t]his is not true of the noises which keep you awake at night’. Williams thought there was no excuse ‘for the bounder who Klaxons his fiery way through streets in residential quarters at 4 a.m. … It is the very Billingsgate of motor language’. 36

A wider debate developed internationally concerning the effects of noise on productivity and public health. In New Zealand, this seems to have centred on urban areas, probably because the country, by international standards at the time, was relatively highly urbanised. The 1916 census had showed the urban population to outnumber the rural for the first time, and by 1921 the four largest cities alone accounted for 36 per cent of the population. 37 Much concern was expressed by medical specialists and the public more generally, both in New Zealand and elsewhere, regarding the effect of motoring noise on the sick, and measures were taken to reduce its impact near hospitals. 38 The noise of large cities was thought ‘largely responsible for so much neurasthenia and general nervous instability, and for impairing not only … health, but also general working efficiency’. 39 Nervous exhaustion or neurasthenia, brought on by the strain of modern life, had been a widely accepted medical diagnosis since the late nineteenth century. Men engaged in intellectual activity were thought particularly susceptible to neurasthenia brought on by noise. 40 Some medical authorities claimed further ‘that the noises on modern roads are most harmful to sufferers from gout and heart complaints’. 41 Noise from motor vehicles was often seen as an urban problem, but it was not confined to the larger cities; complaints came from small towns and rural communities as well. 42

A large amount of traffic was not needed to cause a disturbance: even a single noisy

36 Dr Leonard Williams, 'The Tyranny of Noise', Dunstan Times, 20 September 1926, 7, reprinted from the Empire Review.
38 Bijsterveld, 'The Diabolical Symphony', 51.
41 'The Noise Nuisance', Otago Daily Times, 16 May 1929, 10.
42 'Motor-Cycling: Silence First', New Zealand Herald, 13 November 1926, 36 (Kaitaia); Patea Mail, 16 March 1931, 3 (Kakaramea); 'Noisy Nights', North Canterbury Gazette, 22 February 1935, 5 (Rangiora).
motorcyclist at night was sufficient. Motorists sounding horns caused considerable annoyance in urban centres and eventually prompted government intervention in the late 1930s. Noise abatement campaigns overseas attracted much attention in the New Zealand press, but no similar organised action was taken locally.

Intermittent complaints about the noise from unmuffled motor exhausts and the sounding of horns became a great deal more frequent in the course of 1913. Two years earlier, several reports from London of the noise caused by motor vehicles alerted the urban New Zealand public to the coming problem:

Life in London at the present time is barely tolerable owing to the everlasting series of hoots and toots, shrieeks, wails, barks, grunts, coughs, post-horn gallops and ‘cut-out’ volleys that torture our ears by day, banish sleep by night, and scare us out of our wits at cross-roads and turnings.

The example of cities overseas considered especially noisy—Sydney, Paris, Chicago, Havana—was held up as a warning to New Zealanders. Even before the outbreak of war, the noise of motor exhausts was routinely likened to the sound of gunfire: ‘the pom-pom-like volleying of the “cut-out” of big cars or the Maxim gun patter-patter-patter of small ones’.43 Years after the war’s end, a Dunedin resident complained that motorcycles ‘create a noise like that of a field battery in action’,44 they made a ‘row worse than anything I heard in France’, according to one old soldier.45 The exhaust cut-out, a valve that bypassed the exhaust silencer in order to reduce back-pressure on the engine in the mistaken belief that it would extract more power, was considered a particular nuisance. Motorcycles, with their two-stroke, air-cooled engines, were inherently noisier than most motor cars. When in 1912 the Post Office in Wellington began to collect the mail by motorcycle, complaints about the noise soon appeared: they were a ‘perfect nuisance … People are constantly awakened by the hubbub caused by these machines, and in neighbourhoods where sick people are lying the effect must often be serious’.46 In 1926, one Palmerston North borough councillor claimed that the ‘noise from a motor cycle exhaust could quite conceivably kill a person seriously ill’.47 A Nelson resident complained that he had ‘suffered intensely from [the] horrible infliction’ of motorcycle noise day and night, leading to his insomnia: ‘my health has given way altogether. And all this through the hateful disregard of the feelings of others by the raging, roaring motor cyclist, who seems to glory in the noise he makes’.48

46 The Press, 4 November 1912, 6; see also Evening Post, 13 December 1912, 6.
47 Manawatu Standard (Palmerston North), 13 April 1926, 6.
Even before the First World War, an increasingly exasperated tone at the inability of the authorities to suppress the nuisance of noisy motorcycles is detectable in letters to newspapers from correspondents who claimed to represent the suffering, silent majority of the community against ‘the perverted outlook of the selfish rackety few’. The problem came to be seen as particularly acute by the mid-1920s, when many local authorities introduced by-laws compelling the use of exhaust silencers. Prosecutions were frequent, and the fines typically varied between 10 shillings and two pounds. The problem persisted, however, and complaints continued throughout the 1930s; they subsided during the Second World War, only to revive in 1946. Noisy motorcyclists were difficult to police as, although they drew attention to themselves, they moved quickly enough to evade capture and were difficult to identify at night, when the noise seemed more penetrating. Even in the larger boroughs, traffic inspectors were seldom on duty at night and in any case rarely had motorcycles of their own. Council meetings, court sessions, concerts and church services were disrupted by the ‘dreadful din’ of motorcycles. The offence was compounded by its being quite deliberate: ‘youthful riders of motor bicycles’ enjoyed ‘making all the noise they can, apparently for the purpose of ostentation’ or ‘out of pure “swank”’. Not only did the riders’ youth and anonymity upset notions of social hierarchy, but the noise they created also undermined deeper concepts of civilisation: in 1926, the president of the Otago Motor Club asked noisy motorcyclists ‘to remember that they are in a civilised country, and not in the wilds of Africa or some such place.’

Quietness was a mark of civilisation, and by the mid-1930s it was widely observed that modern cars had become notably less noisy. This was in part due to the more general use of helical gears instead of the straight-cut gears that produced a distinctive howling sound. Noisy car owners were said to ‘have neither good taste nor good manners, much less good sense’; these ‘vacuous and idle pleasure-seekers’ were ‘selfish and inconsiderate … habitually display[ing] the essential qualities of vulgarity—viz., noise, ostentation, and indifference to the feelings of other people’.

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49 ‘Noisy Motors’, Otago Daily Times, 28 October 1913, 4.
50 See, for example, ‘Heavy Fines. Many Complaints re Noisy Exhausts’, The Press, 28 November 1925, 6.
54 Evening Star, 9 March 1926, 6.
56 ‘Noisy Motor-Cyclists’, Evening Star, 10 February 1926, 6.
Increasingly by the late 1930s the age and decrepitude of noisy cars was emphasised by the press, hinting that their owners similarly were not respectable.\(^{58}\) In this, the New Zealand experience resembled the British more than the American. While in the United States discourses about noise ‘were dependent on a specifically American politics of racial difference’, in Britain, social class was more likely to frame the issue.\(^{59}\)

The objections to the noise of car horns stemmed from its suddenness and apparent randomness, as well as its ubiquity. Volume was considered less of a problem than the nerve-wracking nature of the sound itself. Many urban by-laws required for safety reasons a warning to be sounded at intersections or blind corners, and when overtaking. To answer the requirement that a horn or hooter be ‘efficient’, as early as 1916 a range of variously raucous noises was available, from ‘a short, deep grunt’ to ‘a short whistle’.\(^{60}\) Complaints at the resulting noise were widespread, and it was argued that the warning sound rapidly lost its effect once it became commonplace, and led to a dangerous sense of complacency on the part of drivers.\(^{61}\) Yet if a motorist did not sound the horn and an accident took place, he or she could be held liable.\(^{62}\) The practice was not officially suppressed until the Minister of Transport, Bob Semple, took action in 1938, following the well-publicised lead of Britain, Tasmania, parts of the United States and several European countries.\(^{63}\) As a Wellington city councillor from 1925, Semple had been prominent in calls for action to suppress motorcycle noise, which he attributed to ‘flashiness on the part of the road-hogs’.\(^{64}\) Action against unnecessary noise in general was prompted by overseas examples, not least the establishment in Britain in 1933 of the Anti-Noise League.\(^{65}\) The prominent railway engineer Sir Henry Fowler, chairman of the British Ministry of Transport’s Noise Abatement Committee, visited New Zealand in 1935 and told Wellingtonians ‘Your streets are much too noisy’.\(^{66}\)

Sounding of horns was regarded as a particular nuisance near hospitals. Drawing on overseas examples, some hospital boards advocated the creation of special ‘quiet zones’ in adjoining streets.\(^{67}\) Road signs asking motorists to drive quietly and slowly past the public hospital in Dunedin, however, made little difference.\(^{68}\) Patients may

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\(^{58}\) ‘Noisy Vehicles Annoy Aucklanders’, *New Zealand Herald*, 19 March 1938, 40.  
\(^{59}\) Mansell, *The Age of Noise*, 146.  
\(^{64}\) See, for example, ‘Something to be Done’, *Evening Post*, 19 August 1927, 8.  
\(^{65}\) Mansell, *The Age of Noise*, 49.  
\(^{68}\) *Evening Star*, 27 June 1932, 8; ‘The Modern Cacophony’, *Otago Daily Times*, 25 September 1933, 8.
not have appreciated the novelty of 1927, a musical horn that played the first two bars of the Dead March from Handel’s oratorio *Saul*.\(^{69}\) The local motoring association provided blue flags bearing its initials that could be flown outside private houses when an invalid was in residence, but the effectiveness of these is unknown.\(^{70}\)

Some observers detected a deeper meaning in motorists’ fondness for sounding their horns. An analysis of the problem of ‘road hooligans’ in late 1925 concluded the hooting habit is the typical presentation of the motorist’s mentality. The road belongs to him; everyone must give way to him, and he yells to make them do it. It is difficult to understand why people should be condemned to tolerate this nuisance without legal remedy. The law would not countenance pedestrians who made a habit of rushing at top speed along crowded pavements yelling to everyone to get out of their way.\(^{71}\)

The English accountant and writer Stanley Rowland explicitly linked the ‘bruital objurgativeness [sic]’ of motor horns with ‘the influx of semi-barbarous emotional music and dance’ from America. ‘The spread of jazz music and the like has synchronised with the increase of noise and general lack of restraint in the public, and the deterioration in sobriety of demeanour.’\(^{72}\) A similar lack of restraint was seen in those motorists who sounded their horns in residential areas at night to announce their arrival or departure with ‘a persistent toot, toot, toot’.\(^{73}\)

### The visual environment

The growth of motoring quickly was seen to have a detrimental impact on the visual environment also. When in 1940 Viscountess Galway, wife of the Governor General of New Zealand, linked sealed roads with the recent ‘uglification’ of the countryside, she may have been conveying more a British feeling than a local one.\(^{74}\) However, in both countries, roadside advertising aimed at motorists was seen as a major source of visual pollution. Like noise, visual disturbances were tolerated where they were seen as essential or unavoidable. Advertising was perceived as more of a rural problem than an urban one: hoardings were considered much less objectionable in towns than in the country, particularly if they obscured something thought even

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70 ‘Warnings of Illness’, *Otago Daily Times*, 7 November 1935, 8.
74 ‘Diploma Winners: Centennial Exhibition’, *New Zealand Herald*, 7 March 1940, 2.
uglier, whereas the scenery was considered a major attraction of rural motoring. The early campaign against roadside advertising focused on areas of natural beauty where signs had been attached to trees and bridges or painted on rock faces.

The growth of motoring was thought largely to blame for the spread of roadside advertising, much of it for car-related products and services such as oil and tyres. Yet this targeted advertising attracted criticism as much from motorists as the wider public, and pressure from car-owning consumers was therefore expected to be most effective.75 The *Auckland Star*, for instance, argued in 1932 that as motorists were among the best-organised sections of the community they were therefore well able to make their influence felt.76 Attempts to have roadside advertising hoardings removed began in the early 1920s and intensified in the early 1930s, attracting the support of some prominent public figures and gaining a degree of success with oil companies. It was an issue both proponents and opponents of motoring could agree upon. The principal owner of hoardings, however, the government Railways Department, stood firm. Motor clubs joined local councils and civic societies in the campaign to have hoardings removed on both aesthetic and road-safety grounds. The principal safety criticisms were that hoardings obstructed lines of sight for drivers and that signs either distracted motorists or caused them to ignore important warning signs. Aesthetically, objectors complained ‘their general glaring effect [was] so annoying to anyone with the slightest idea of the fitness of things in surroundings’; hoardings ‘rouse one’s ire with their silent shouting’.77 Further, the Auckland Automobile Association complained that some advertisers designed their signs to be mistaken for the association’s own official signs.78

New Zealand motorists were well aware of the campaign against roadside advertising in Britain initiated by the Society for Checking the Abuses of Public Advertising (SCAPA), founded in 1893, which had resulted in the major oil companies agreeing to withdraw their advertising from roadsides. An additional measure was the passage of the *Advertisements Regulation Act 1925*. The Royal Automobile Club (RAC) had given SCAPA its support during the First World War.79 The New Zealand press supported what was seen as the local manifestation of an international campaign by reprinting many stories about the excesses of roadside advertising in the United States, as well as in Britain and even Italy, where the

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76 ‘The Roadside Sign’, *Auckland Star*, 7 September 1932, 6.
77 ‘About Hoardings’, 4. In the United States, urban billboards were also associated with the dumping of rubbish and were seen as threats to ‘health, beauty, and morality’: see Adam W. Rome, ‘Coming to Terms with Pollution: The Language of Environmental Reform, 1865–1915’, *Environmental History* 1, no. 3 (1996): 19.
Fascist government banned it outright in 1938. There was, however, no equivalent of the American nationwide anti-billboard campaigning organisation, the National Roadside Council. The prominent role of women in the American campaign also appears to have had no New Zealand parallel, yet on the other hand the prominence of motoring organisations in the New Zealand campaign seems not to have been echoed in the United States.  

The campaign initiated by the motor clubs had some initial success, particularly with the larger oil companies. It had begun to gather momentum in early 1924 when motor clubs joined the Counties Association to put pressure on advertisers. The Christchurch morning newspaper pressed resolutely for action against roadside advertising for many years. Reporting the withdrawal of advertising by major oil companies in Britain in early 1924, The Press urged New Zealand automobile associations to follow the RAC’s example and become ‘the unofficial protector[s] of country roads’ from the ‘unconscious vandal’. The Marlborough Automobile Association was credited with having first taken up the call for a campaign against roadside advertising a few months later. The South Island Motor Union (SIMU) sent a deputation to the New Zealand Motor Trade Conference in September 1924 to ask that its members advertise ‘in an ethical way’, and was given an undertaking that the trade would assist in prohibiting objectionable rural advertising. It went on to gain the support of other regional motor clubs in the SIMU for a ban.

Firms that supplied motorists were the most susceptible to pressure, but the line taken by motoring organisations could be undermined by their journals’ reliance on advertising. The official journal of the SIMU, for instance, carried large advertisements on its front cover in 1929 depicting roadside signs for Big Tree petrol. One showed the firm’s name painted on a large boulder with the caption, apparently not intended ironically, ‘Do you know where this is?’ Another showed a rubble-strewn field with a water tank covered in advertising for Big Tree, blocking a view of Lake Pukaki and accompanied by the slogan ‘A delightful place to stay’. To present-day eyes, this could easily be mistaken for an advertisement campaigning against roadside advertising.

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84 ‘Rural Advertising: Defacing Beauty Spots’, *Auckland Star*, 9 October 1924, 8.
86 *The New Zealand Motor Owner* 1, no. 10 (16 September 1929): [1].
87 *The New Zealand Motor Owner* 1, no. 12 (15 November 1929): [1].
The effect of voluntary bans proved only temporary, prompting the SIMU to write to its constituent clubs in 1931 urging them to press their local councils to take action on the issue.88 Local beautifying societies approached motor clubs for their support in the campaign.89 The clubs lobbied their members of parliament to support legislation to allow county councils to ban roadside hoardings.90 Motoring organisations were able to place effective pressure on some of the more prominent advertisers. In response to a request by the SIMU, the Vacuum Oil Company in 1927 declared its opposition to ‘the erection of advertising material in or about rural districts which would tend to disfigure or mar the natural beauties’ and would in future confine its advertising to the vicinity of towns.91 This echoed the move by its former owner Standard Oil in the United States in 1924, and was followed by the other oil companies operating in New Zealand.92 Yet the campaign against other advertisers continued, and in 1929 the North and South Island Motor Unions made a combined representation to the government to introduce legislation to ban all roadside advertising, a demand they repeated in 1930 and 1931.93 Eventually, in 1932, the North Island Motor Union (NIMU) appointed a special committee to frame legislation to meet the ‘evil’.94

Though it made little progress with the national government, local councils were more receptive to the campaign. Without national legislation, however, they were unable to take legal action against hoardings on private property, and land owned by the crown was exempt from council by-laws. The Railways Department was particularly recalcitrant, telling a deputation from the Oamaru Beautifying Society that a particular hoarding would ‘improve the locality’.95 For its part, the Association of New Zealand Advertisers argued that well-designed hoardings were of value in hiding offensive places or ugly buildings, though it agreed they should be banned in the country where they would mar the landscape.96 The campaign against roadside advertising attracted a great deal of respectable support, not least from the Governor-General, Lord Bledisloe, who in 1932 secured an assurance from the oil companies that they would remove their advertising from country roads.97

88 ‘Roadside Hoardings: Defacing the Countryside’, Ellesmere Guardian (Southbridge, Canterbury), 10 April 1931, 8.
89 New Zealand Herald, 14 April 1927, 16.
There were some limited local successes for motor clubs. The Marlborough Automobile Association gained the willing support of the county council to remove roadside advertising in 1931, though it had no power over signs on private land.\textsuperscript{98} The Auckland Automobile Association approached local businesses in 1932 and persuaded them to withdraw their advertisements from hoardings along a newly built stretch of a major highway south of the city.\textsuperscript{99} Shell Oil, which had withdrawn its roadside advertising in Britain in 1924, finally did so in New Zealand in 1932.\textsuperscript{100}

The campaign prompted at least one case of direct action against roadside advertising. Protests against unsightly signs in a picturesque river valley in Central Otago had been made to the Minister of Railways without success by a range of regional promotional and environmental associations, including the Otago Motor Club, the Otago Expansion League, the Amenities and Town Planning Society, the Native Bird (from 1935 Forest and Bird) Protection Society, and the Otago Institute, the principal provincial scientific body. Frustrated at what they saw as the government’s lethargic indifference to hoardings in areas of natural beauty, ‘an intolerable outrage’ that made ‘the country hideous’, a group of respectable professional men from Dunedin set off inland in 1930 to ‘clean up’ the Picturesque Kawarau Gorge. Three of them were medical practitioners, including a 65-year-old professor at the University of Otago Medical School, a prominent member of the Otago Motor Club and the Amenities Committee of the Expansion League who had been protesting against roadside hoardings since at least 1920.\textsuperscript{101} ‘[I]ntoxicated with zeal’, they cut down five signs, including a large railway-owned hoarding, which they thought ‘desecrated a particularly fine piece of scenery’.\textsuperscript{102} Convicted and fined for wilful damage, they explained their motivation:

\begin{quote}
Our scenic routes are strewn with placards, sheds and roofs of buildings are daubed with advertisements, even, the trees, fences, and rocks are not immune. The craze for advertising has reached such a pitch that no place is sacred; the greater the natural charm, the more opportunity for vulgar display … Surely the road users have some rights.\textsuperscript{103}
\end{quote}

\begin{footnotes}
\textsuperscript{98} ‘Roadside Hoardings’, \textit{The Press}, 16 November 1931, 7.
\textsuperscript{99} ‘Roadside Hoardings’, \textit{Auckland Star}, 18 October 1932, 14.
\textsuperscript{100} ‘Unsightly Hoardings’, \textit{Evening Post}, 29 September 1932, 10.
\end{footnotes}
Despite the widespread support for the campaign against roadside advertising, success was limited, and on the eve of the Second World War the national conference of beautifying societies still felt the need to urge the government to control advertising hoardings. A delegate to the NIMU in 1939 identified the fundamental conflict between the motorists’ policy and the Railways Department’s: the motorists put up warning signs at dangerous places, while the department put up ‘distracting advertisements’. In Christchurch, the editor of *The Press* ‘deplored … the fact that the activity and influence of the Railway[s] Department have unquestionably prevented reform while they have extended the mischief’. The railways had made a profit of £18,000 from roadside advertising over the previous seven years, so had a clear motive for resisting the attempts of the Internal Affairs Department to restrict the ‘undesirable enterprise’. The Canterbury Roadside Beautifying Association had made no progress with the newly appointed Minister of Railways in 1936, even though, when in his previous position as Mayor of Christchurch, Dan Sullivan had expressed his opposition to the department’s roadside hoardings. As the president of the Marlborough Automobile Association had put it in 1930, the state was one of the worst offenders with regard to advertising hoardings: ‘The others mostly are amenable to reason, but you can’t get any reason out of the State.’ The question was not to be resolved until well after the Second World War.

**Conclusion**

Early motor cars were regarded as being more of an assault on the human senses than on the environment as such, though it was one that was difficult to quantify. The noises they made could affect anyone, anywhere. Exhaust fumes, though a nuisance to the public, were seen largely as a danger only to the incautious motorist. Motorists themselves were also at the forefront of complaints about the harm done to the visual environment indirectly by the growth of motoring. In each of these concerns, New Zealand opinion drew on and was primed by international experience. Newspapers were particularly important in this process, but the cultural conduit provided by such figures as the governor-general also played a part. Noise in particular fitted into an international discourse on the nature of the modern world: technological advances were making the world a noisier place, but not all noises had to be tolerated in the name of progress. Noisy cars and motorcycles

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108 A private member’s Hoardings Bill was introduced in 1948, but was heavily defeated. Opponents argued that the proposed ban would harm commercial interests, but also that ‘many hoardings were attractive and helped to mould better public opinion’: ‘Hoardings Bill: Private Interests Affected’, *Otago Daily Times*, 5 August 1948, 5.
109 See also Tony Nightingale and Paul Dingwall, *Our picturesque heritage: 100 years of scenery preservation in New Zealand* (Wellington: Department of Conservation, 2003).
were joined by speedboats, radio loudspeakers and pneumatic drills as sources of complaint in the course of the 1920s. In the case of noisy motorcyclists, a hyperbolic sense of powerlessness on the part of the respectable members of society was coupled with the feeling that the social hierarchy was being challenged by the youthful and uncivilised. While visual pollution and some forms of noise pollution remained intractable problems, others seemed to have been resolved by the end of the interwar period. Cars had become much quieter, and their drivers had been induced to desist from honking their horns. Concerns regarding vehicle emissions were still far in the future.
Abstract

Competition for land between food and fuel crops dampened enthusiasm for biofuels cultivation as a mechanism for reducing European Union (EU) carbon emissions. Non-agricultural crops grown on marginal non-agricultural land, referred to as third-generation biofuels, were proposed as a solution. Researchers and analysts used globalised statistics, databases and models to search for biofuels cropland. Two new categories of land emerged: the African Guinea Savannah Zone and global spare land. Guided by environmental history, a desktop ground-truthing exercise enabled a preliminary assessment of the largest regions of this newly ‘discovered’ land.

Keywords: European Union energy policy, Guinea Savannah Zone, unused land, climate change, GAEZ, intensified grazing systems

Introduction

Modelling has been widely used in constructing the responses of the European Union (EU) to Kyoto-mandated greenhouse gas emissions curtailment. Increasingly sophisticated computer capabilities, advances in information technology and globalised statistics enabled calculations supporting arguments for replacing fossil fuels with agrofuels (biofuels made from agricultural crops). Near-universal enthusiasm surrounded national and EU directives to process excess oil crops into biodiesel, and grain and sugar crops into bioethanol. However, at implementation, the modelled world collided with agronomic reality. The EU had neither enough
crop surpluses nor—even with expansion—sufficient land under favourable growing conditions for biofuel feedstock cultivation. In response, a global market was created to stimulate biofuels feedstock production in poor countries. Agrofuels were supposed to provide a new revenue stream for achieving Millennium Development Goals. When land competition between food and fuel became apparent, so-called second-generation (non-food) biofuels were proposed. Agrofuels were renamed first-generation biofuels. Crop residues, forest by-products and lignaceous non-agricultural crops were to be converted into biofuels using still-theoretical production processes. However, long-term agronomic and forestry data from diverse locations and ecosystems demonstrated serious negative consequences. Third-generation biofuel crops were then defined: non-food crops grown on non-agricultural land at industrial scales. This shifted attention from crops to soils: non-agricultural land had to be defined and located.

A decade after the first biofuels directives, both global databases and models had increased in complexity. New model-based analyses of the potential for agricultural expansion introduced two concepts: Africa’s Guinea Savannah Zone and ‘global spare land’. The former has a specific geographical context and reaffirms colonial assumptions about the continent of Africa. In contrast, global spare land is not linked to any place and, therefore, implies the absence of conflict with human activity. Global spare land is a soothing antidote to assertions of biogeographical and sociocultural limits to biofuels production. Since both new land categories have entered the larger literature, as well as discussion down to the level of student papers, it is worth examining the origins of these concepts and the validity of their use.

Of particular interest to the biofuels community are two publications from authoritative institutions apparently documenting substantial amounts of suitable land. The World Bank’s *Awakening Africa’s Sleeping Giant: Prospects for Commercial Agriculture in the Guinea Savannah Zone and Beyond* presents maps of modelled marginal land identified as the African Guinea Savannah Zone. The Scientific Committee on Problems of the Environment (SCOPE)’s *Bioenergy and Sustainability: Bridging the Gap* uses tables to assert the existence of global spare land of good quality. As a contribution to the discussion of constraints to biofuels production, an environmental history-based preliminary desktop ground-truthing exercise was carried out to confirm the accuracy of these modelled global projections.

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The following analysis builds upon ideas developed in Parts 1 and 2 of this series of papers regarding global soil, terrain and land database and model construction, sources of bias, professional networking and circular citations. Assessing the reliability of the two publications involved posing basic questions from agronomic, environmental and environmental history perspectives. What definitions, methodologies and technologies had been used to identify the land cited? To what extent were the models and databases self-referencing? What would be the consequences of introducing the proposed intensified livestock management systems to release land for biofuels feedstock production at an industrial scale? Finally, since both reports were written without field verification, what is known about the actual properties of the landscapes identified, their past uses and current conditions?

Defining unused land

Digitisation enabled data manufacture and manipulation. Applying emerging technologies, researchers collaborated to produce soil, land and terrain databases, and models at a global scale. In response to critics’ assertions of exacerbated worldwide land shortage, biofuels’ advocates reinterpreted data used in earlier analyses of agricultural land databases, and applied models based on geographic information systems (GIS) to search for vacant land.

PropONENTS’ calls for third-generation biofuels to be grown on marginal non-agricultural land marked a retreat to abstraction. There is no universal definition of marginal land. Sarah Lewis and Maggi Kelly’s 2014 review of GIS-based biofuels analyses found general theoretical agreement that marginal land was land unsuited for agriculture.

However, each set of authors had a different working definition to guide decisions made about and within model operation. The amount of land identified depended upon the criteria applied for land use, land rights and land ownership, as well as soil, terrain and climate characteristics. The earliest estimates came from simple

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analyses of available databases—first at the national and regional levels, then at the global scale. Promoting the use of marginal land instead of the earlier category of ‘potentially arable land’ implied new land had been identified.\(^7\)

**Marginal land**

Marginal land has been defined in terms of both biophysical and economic criteria. A United Nations Educational, Scientific and Cultural Organization (UNESCO) glossary defined marginal land as being of poor quality, largely unsuitable for cultivation due to nutrient deficiencies, dryness or susceptibility to erosion, and included notions of degraded land and wasteland.\(^8\) The UN Environment Programme identified degraded land as that which had a long-term loss of ecosystem function and services caused by disturbances from which the system could not recover unaided.\(^9\) L. R. Oldeman et al., creators of the Global Assessment of Soil Degradation (GLASOD) database,\(^10\) defined wasteland as land without appreciable cover or agricultural potential, consisting of six types—active dunes, salt flats, rock outcrops, deserts, ice caps and arid mountain regions.\(^11\) Soils in these places are fragile and particularly prone to further degradation if cultivated. Using them would require substantial investment in comprehensive research concerning their properties and management, as well as in soil amendments.

In contrast, economists have created a relative, non-biophysical definition of marginal land based on use value. This definition fits well with derived and digitised land resource databases. George Peterson and John Kenneth Galbraith theorised marginal land as that which is peripheral to commercial agricultural production, or land on which the cost of production equals the revenues from optimal production.\(^12\) The Consortium of International Agricultural Research Centers expanded the definition of marginal land to include the people dependent upon it. Marginal people are those facing socioeconomic constraints. Concentrations of marginal people farming marginal land constituted a marginal area. Agricultural development projects could be usefully directed at marginal areas (which could contain both marginal and

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favoured land) if measurable economic change could be imagined. Marginal lands were further subdivided into land with high and low expectations of a productivity response to changes resulting from agricultural research.\textsuperscript{13}

Promoters of third-generation biofuels have based their advocacy on estimates of economically defined marginal land. However, critics have noted mythic beliefs attached to the extent and potential of marginal land.\textsuperscript{14} In 2007, Richard Doornbosch and Ronald Steenblick warned that reliable estimates do not exist, since double-counting was widespread and the UN Food and Agriculture Organization (FAO) figures consistently underestimated the amount of land already in use.\textsuperscript{15}

**Global spare land**

Global spare land was identified and named by version 3.0 of the Global Agro-Ecological Zone (GAEZ).\textsuperscript{16} The AEZ-GAEZ model family resulted from a collaboration between the International Institute for Applied Systems Analysis (IIASA) and the FAO. The widely used 2002 GAEZ version 2.0 had identified ‘potentially arable land’ that included inhabited areas and the tropical rainforests of the Amazon and Congo basins. In contrast, the 2012 version 3.0 excluded urban areas, forests and protected land. Instead, land supporting wild ungulates and extensive grazing of domestic livestock was coded as underutilised. As a result, grassland (savannah, plains, prairie) was classed as prime or good ‘spare land’ that could be brought into cultivation.\textsuperscript{17}

**Finding unused land**

Models replaced explorers in the early twenty-first-century search for unused agricultural land. In 2009, a World Bank team of economists announced the discovery of Africa’s Guinea Savannah Zone. It was described in their report *Awakening Africa’s Sleeping Giant*, which was a study of the potential for large-scale commercial agriculture on the African continent. The new zone consisted of two broad bands stretching across the continent, together with some scattered fragments and part of an island. The African Guinea Savannah was described as having
important characteristics for crop production. It was ‘one of the major underutilized resources in Africa’, ‘one of the largest underused agricultural reserves in the world’ and a ‘very large agroecological zone that is recognized as significantly underutilized’. Its extent was said to be ‘600 or 700 million ha, 400 million ha of which can be used for agriculture’, less than 10 per cent of which was used for crops.\textsuperscript{18}

Six years later, a report by the Paris-based SCOPE declared the end of land constraints to biofuels production due to abundant newly discovered global spare land. \textit{Bioenergy and Sustainability} was the result of a rapid assessment process carried out at a workshop. Fifty ‘experts’ from 13 countries met in Paris to hold ‘crosscutting discussions’ on four themes (Energy Security, Food Security, Environmental and Climate Security, and Sustainable Development and Innovation) based on background chapters commissioned before the workshop. The editors of the resulting report thus were able to claim to have drawn on contributions by 137 individuals from 82 institutions and 24 countries.\textsuperscript{19} These numbers implied international authority and consensus for the assertion that 1.4 billion hectares of global spare land classed as good or prime was available for biofuels cultivation. Sixty per cent of this land existed in just 13 countries: Brazil, the United States, the Russian Federation, Argentina, Australia, Sudan, China, the Democratic Republic of Congo (DRC), Kazakhstan, Angola, Canada, Mozambique and Madagascar (in descending order).

\textbf{Creating landscapes}

The African Guinea Savannah Zone, a model output expressed in map form, is credited to the International Food Policy Research Institute (IFPRI). The mapped zone originated in a data set published by Kate Sebastian in 2009 (v.2 released in 2013).\textsuperscript{20} Operating at a regional scale, the zone was defined as ‘geographical areas exhibiting similar climatic conditions that determine their ability to support rainfed agriculture’.\textsuperscript{21}

Three categories had been used to identify the African agroecological zone: major climate zone (tropics or subtropics), moisture zones (water availability) and highland/lowland (warm or cool, based on elevation).\textsuperscript{22} Soils in the identified area were described using US Department of Agriculture (USDA) Soil Taxonomy at

\begin{footnotesize}
\begin{enumerate}
\item World Bank, \textit{Awakening Africa’s Sleeping Giant}.
\item Souza et al., \textit{Bioenergy and Sustainability}.
\item Sebastian, ‘Agro-ecological Zones of Africa Dataset’.
\item ibid.
\end{enumerate}
\end{footnotesize}
the order level of classification, and were summarised as being of poor quality.\textsuperscript{23} The modelled African Guinea Savannah Zone was revised after comments from World Bank ‘experts’.\textsuperscript{24}

The actual map was produced by the World Bank’s Jeff Lecksell, based upon information provided by Stanley Wood and Zhe Guo at IFPRI.\textsuperscript{25} The map was ‘developed using [Jami L.] Dixon’s farming systems data, the length of growth period from IIASA (or some remote sensing product) [sic], and [the] revised version of Agro-ecological Zones developed by IFPRI’.\textsuperscript{26}

FAO’s John A. Dixon et al.,\textsuperscript{27} commissioned by the World Bank, had classified the world’s farming systems according to: 1. the availability of the natural resource base; 2. the identified dominant pattern of farming and household livelihood; and 3. the intensity of production. This framework was then ‘applied to the 6 main regions of the developing world’, resulting in ‘72 farming systems with more than approximately 40 million inhabitants’.\textsuperscript{28} To reduce detail, the systems were further consolidated into eight major categories, which produced ‘considerable heterogeneity within each delineated zone’.\textsuperscript{29} Quantitative analysis of farming systems productivity relied upon the statistics provided in Nikos Alexandratos and Jelle Bruinsma’s \textit{World Agriculture: Toward 2015/30: Interim Report}.\textsuperscript{30} This report, in turn, presented the results of FAO/IIASA’s GAEZ v.1, which had been first published as the TERRASTAT database.\textsuperscript{31} Because it included both the Amazon and Congo River rainforests, GAEZ version 1.0 analysis had shown 90 per cent of the world’s remaining ‘potential arable land’ for agricultural expansion to be in Latin America and sub-Saharan Africa.

The World Bank economic team used the IFPRI reinterpretation of FAO data for the continent of Africa. This \textit{continental} scale of analysis was then applied in a case study of comparative analyses with ‘similar regions’ in the \textit{countries} of Brazil and Thailand. The result was an optimistic report asserting the existence of an extensive, previously unrecognised and currently unused ‘ecological zone’ suitable for large-scale agriculture on the African continent.

The GAEZ model family was also an integral part of the SCOPE report. Central to the analysis of \textit{Bioenergy and Sustainability} was Alexandratos and Bruinsma’s \textit{World Agriculture: Towards 2030/2050: The 2012 Revision}. This report was based on

\textsuperscript{23} World Bank, \textit{Awakening Africa’s Sleeping Giant}, 25.
\textsuperscript{24} Zhe Guo, via Michael Go, IFPRI. Email to author, 6 April 2016.
\textsuperscript{25} Guo, email to author, 6 April 2016.
\textsuperscript{26} ibid.
\textsuperscript{28} ibid., 2.
\textsuperscript{29} ibid.
\textsuperscript{31} Discussed in detail in Showers, ‘Biofuels’ unbalanced equations’, part 1.
data from the 2012 update of GAEZ version 3.0. It had produced higher estimates of unused land than had the widely used version 2.0 or the 2011 update of 3.0. Alexandratos and Bruinsma discussed the difficulty in determining the reasons for the inconsistencies. Different databases and other variables had been used.32 In the SCOPE report, calculations were based on an estimated 7.2 billion hectares identified as having rain-fed production potential. After subtracting estimates of 1.6 billion hectares already under crops, 2.8 billion under forest and 1.5 billion of poor-quality land, an estimated 1.4 billion hectares of prime land remained—most of which was grassland. Because it had been coded as underutilised, this became the ‘global spare land’ that could be brought into cultivation.

### Denying diversity

Fundamental to the creation of global statistics and databases—as well as models operating with them—is the idea of general descriptions of uniform entities. Averaging and data-smoothing techniques create homogeneous and harmonised globalised data sets and databases.33 Analysis at a global scale, therefore, has within its structure the conscious elimination of information and the deliberate suppression of variation. Researchers using these tools may apply analytical methods that further minimise differences or characteristics that distinguish one ecosystem or component from another.

The World Bank researchers avoided confronting diversity in two ways: scale and case study. Basing analysis on a continental map resulted in the loss of geography and the appearance of homogeneity. The mapped African Guinea Savannah Zone fails to indicate that the African continent constitutes 22 per cent of the earth’s surface, that many countries are larger than those of Europe, and that the continent is diverse at all scales—from soil microbiology, flora and megafauna to geomorphic features and climate regimes. The assumed uniformity of the modelled African Guinea Savannah Zone obscures the range of soils included in the modelled zone: from the French system’s ferrasols, ferralic soils and fersialitic (ferruginous) soils across much of the indicated region of West Africa to FAO/SOTER’s Arenosols, Lixisols, Calcisols and Luvisols in Mozambique. Local soil heterogeneity and complexity are important—if not essential—for landscape function and plant growth. The predominant, large and apparently flat dryland plateaus on which most African grasslands exist are actually complex mosaics of slightly inclined water-shedding and water-collecting (and storing) surfaces. This creates a variety of soil hydrological conditions within a relatively small area. Each supports not only diverse microbial communities but also physically small biota that increase or decrease water infiltration while supplying

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33 Fully discussed in Showers, 'Biofuels' unbalanced equations', part 1.
nutrients. Much of the indicated region has at least a six-month dry spell, with erratic rainfall during the wet season. In some places, this consists of two irregular rainy seasons of different lengths. Evapotranspiration rates can exceed precipitation during the growing season. These conditions present significant challenges for plant growth.

The Bioenergy and Sustainability analysis of global spare land is based upon modelled estimates. The editors responsibly call for further investigation for verification and to refine project development. Nevertheless, the report claims, without reservation, that not only does global spare land exist, but it does so in sufficient quantity to provide enough biofuels to mitigate greenhouse gas emissions without causing environmental harm or food insecurity.

**Ground-truthing model results**

Anyone can, and model makers and model users should, assess both the accuracy and the practicality of model results by initial comparisons with independent, measurement-based biogeographical descriptions, land-use evaluations and environmental histories. Particular attention should be paid to the quality of databases used, the consequences of model assumptions, and factors excluded from databases and models, as well as by the model operators.

**World Bank/IFPRI’s African Guinea Savannah Zone**

*Africa’s Sleeping Giant* purported to demonstrate the potential for economic development based on large-scale farming within the modelled zone, ‘transforming the natural ecosystems found in the Guinea Savannah Zone into vibrant commercial farming systems [and] restoring agricultural competitiveness’.

Analysis was performed at the national level, obviating consideration of complications and constraints faced by individual farmers, regardless of their scale and type of operation. Only two of the 27 countries listed (Gambia and Guinea) lie entirely within the identified area. Therefore, the national statistics used in the analysis reflected the productivity of sometimes larger areas outside the modelled zone that have entirely different—and perhaps more favourable—soil and climate characteristics.

Consistent with the model’s denial of diversity, the economists chose case-study analysis as their methodology. They selected three countries—Nigeria (West Africa), Zambia (Central Africa) and Mozambique (East and Southern Africa)—without mentioning their selection criteria. There is no discussion of how these three could

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represent the other mapped countries, or why the two falling entirely within the modelled zone had not been considered. It is unclear how Nigeria—whose economy has been so distorted by oil revenues that it gave rise to the term ‘Oil Curse’—and Zambia, dominated by its mineral and mining sector—could typify the other countries whose economies depend more on livestock and annual and perennial crop production. Nigeria and Mozambique are similar in having had post-independence wars. Nigeria’s was a destructive, but limited, civil war (stimulated by oil), followed by military rule. Mozambique was, for 30 years, a target of Apartheid South Africa’s military. In the early twenty-first century, there were, still, undetonated and unmapped landmines scattered throughout the countryside, particularly near agricultural areas. Most of the other countries have not been defined by war. Unlike all of West Africa and some countries in Central and East Africa, Zambia had a large European settler population that at independence controlled extensive areas of the best agricultural land, as well as dominating the mining sector. What all 27 do have in common is a lack of soil amendments required for large-scale crop production, minimal infrastructure and a general paucity of transport.

An underlying assumption was that the modelled African Guinea Savannah Zone constituted an unused ‘natural ecosystem’, ready for transformation. However, extensive land-use patterns explain the report’s characterisation of a region with low population densities. Much of the mapped area is classified as having semi-arid to arid climate regimes. With sparse and unpredictable rainfall, there is a long history of agro-pastoralism and pastoralism. Drought-tolerant perennial crops, such as western Sudan’s *Acacia senegal* trees, which produce high-quality (and high-priced) gum arabic, have long provided economic value to sandy soils unable to support grain or vegetable crops. The authors indirectly recognised the fallacy of equating population density with land availability. They noted that because ‘virtually no area is entirely unused or unclaimed’, land tenure would ‘certainly pose a significant problem because commercial agricultural development could not be achieved without converting forest and pastureland’. The World Bank’s *World Development Report 2008* notes that when population density is adjusted for land quality, much of sub-Saharan Africa resembles Asia in terms of land shortage. By this calculation, Kenya, whose western fringe is in the modelled African Guinea Savannah Zone, has a population density higher than that of Bangladesh. Whether or not the case study analysis accurately reflects the three selected countries, it is highly unlikely that the analysis warrants generalisation to the other 24 in the mapped zone.

37 ibid., 10.
39 ibid.
The inaccuracy of intercontinental agricultural extrapolation was subsequently confirmed in Mozambique. In 2009, the same year that *Africa’s Sleeping Giant* had been released, a joint project was announced between the government of Mozambique, the Japan International Cooperation Agency and the Brazilian Cooperation Agency to develop large-scale commercial agriculture in the Nacala Corridor of Mozambique. Called ProSavana, the project was to include 19 districts in three northern provinces, covering 14 million hectares considered suitable for cultivating export crops of soybeans, cotton and maize. The project was to be modelled on the Japanese-supported 1970–90 conversion of Brazil’s Cerrado into one of the world’s most profitable soybean-growing areas. However, when the Mozambique region’s many small farmers saw the destructive effects of Agromoz, an early Brazilian–Portuguese joint venture in Nacala, rural resistance spread. Local observations were confirmed by a National Farmer’s Union (UNAC) trip to Brazil’s Cerrado in 2012. The delegation was shocked by the sterility of the agro-industrial landscape—devoid of wildlife, plant diversity and people. Demonstrations against ProSavana began, and protests spread throughout Mozambique. Project funds were withdrawn, and the Japanese official who was responsible, Hiroshi Yokoyama, is quoted as having said:

> We made a gross error of judgement. At the start, we thought it would be possible to reproduce the Mato Grosso experiment. Then we realized [Nacala and Mato Grosso] were very different, and that it wouldn’t be appropriate to apply a Brazilian development model here.41

### IIASA/FAO and SCOPE’s global spare land

Because the African Guinea Savannah Zone and global spare land are linked by the GAEZ model, there is an overlap of four nations identified with ‘unused land’: Angola, the DRC, Mozambique and Sudan. They share recent experiences of war and limited field-based soil information. Angola endured a civil war, as well as being a target of Apartheid South African aggression, and semi-arid to arid North and South Sudan’s border area (a division unacknowledged in either model) was a battleground in the early twenty-first century. The south-eastern part of the DRC (included in the African Guinea Savannah Zone) is a mineral-rich region with multinational mining interests and was an active war zone in the late twentieth and early twenty-first centuries. Despite the soils of the DRC having been listed on the FAO/UNESCO paper map as being ‘virtually unknown’, a modelled DRC soil map exists. Soil scientists using the SOTER Digital Database had created a Central African soil map using virtual soil profiles and extrapolation from known data.42

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40 For detailed discussion, see Stefano Liberti, ‘Mozambique Won’t be Mato Grosso’, *Le Monde Diplomatique*, June 2018, 8–9.
41 Ibid., 9.
However, the four countries GAEZ v.3.0 identified as containing the most spare land are not on the African continent. They are located in South and North America and Eurasia—the latter two described by earlier versions of GAEZ as having little available unused land. The following descriptions of the spare land identified in the top four countries—Brazil, the United States, the Russian Federation and Argentina—should raise fundamental questions not only about the concept of spare land, but also about the validity of exploring for land using computer modelling and simulation.

Brazil’s Cerrado biome

Cerrado, the name given to the natural vegetation covering 200 million hectares of the Brazilian interior, ranges from treeless grasslands and grasslands with sparse trees and shrubs to closed xeromorphic forests (called cerradão). The extremely flat landscape has very old and weathered soils. They are classified in the USDA Soil Taxonomy primarily as oxisols (ferralitic soils), with some ultisols. These dystrophic soils are acidic (very low pH) and have little ability to retain the few base minerals that exist. It is aluminium, rather than the bases, that dominates the ion exchange system and determines which organisms can survive in the biome. The soils also have very low levels of phosphorus, little of which is in a form available to plants.

Despite harsh growing conditions, the cerrado biome has been designated a biodiversity hotspot, containing an estimated 160,000 species of plants, fungi and animals, with at least 90,000 species of insects, 40,000 species of fungi, 10,000 species of angiosperms, 150 species of mammals, 550 species of birds and a highly varied soil microbial community. The physiological and ecological characteristics and significance of the soil microbial communities are only beginning to be understood. Nitrogen-fixing bacteria have long been recognised in cerrado soils. Janaina Araujo et al. posit that microbial biomass also conserves a considerable portion of available soil phosphorus. In addition, acidobacteria phyla—prolific producers of secondary metabolites, such as antimicrobial compounds—could be important in the suppression of other bacterial populations. The unique and resilient cerrado biome has been largely unstudied, and remains unprotected. In the early twenty-first century, there was extensive land conversion for soybeans, biofuels and livestock production; the remaining undisturbed cerrado is under serious threat.

44 Furley and Ratter, ‘Soil Resources’.
46 Araujo et al., ‘Characterization of Soil Bacteria Assemblies’. 
The biome’s contribution to global processes has not been elaborated, but both vegetative and soil biota sequester large amounts of carbon. Since surface albedo is important in models of local, regional and global climate patterns, what would be the significance of transforming 200 million hectares of cerrado vegetation to the darker surfaces of oxisols and ultisols with agricultural crops? What would happen seasonally and annually to local, regional and global hydrologies if the cerrado transpiration rhythms and amounts were disrupted and replaced by intensive, irrigated monocrop systems? Finally, what would be the consequences of rhizosphere disturbance, if not destruction, and how would it be manifested?

The United States and Canada’s Prairie Pothole Region

Much of the central North American prairies (called the Corn Belt in the United States) was ploughed for grain production in the twentieth century. Converting the remaining prairie land to cultivated fields for biofuels was theoretically calculated before, and studied after, implementation in 10 states of the Corn Belt. Using experiment station research data in computer models, Ilya Gelfand et al. calculated the possibility of producing 21 gigalitres of ethanol/year from cellulosic feedstocks planted on approximately 11 million hectares of fertilised marginal land without any initial carbon debt or indirect land-use costs. Defying model predictions, the prairies underwent radical land cover/land use change following the implementation of government policies promoting biofuels cultivation. Christopher Wright and Michael Wimberly made an actual regional accounting of grassland conversion consequences between 2006 and 2011 in the western Corn Belt states containing the most remaining grass-dominated land cover. Destruction rivalled that of the 1920s–30s era of agricultural mechanisation. They found conversion rates of 1.0–5.4 per cent per year. These rates are comparable to those of the 1980s–90s deforestation associated with agricultural expansion in Brazil, Malaysia and Indonesia that caused international alarm. Prairie loss is less shocking because industrial societies value grasses less than trees. Consequently, the temperate grassland biome is the most altered globally and least protected. Conversion of the Corn Belt’s indigenous pre-settlement tall grass prairie land has larger regional, and global, significance because it includes the Prairie Pothole Region and Nebraska Sand Hills.

The Prairie Pothole Region (extending north into Canada) is the most productive waterfowl-breeding habitat in North America, as well as an important breeding ground for Neotropical migratory shorebirds. Biofuels cultivation encroached upon the grassland adjoining wetlands. These areas are critical to the success of duck breeding because they reduce predation. Grassland conversion also occurred in land previously set aside in conservation reserve programs. The resulting loss of grass

48 Christopher K. Wright and Michael C. Wimberly, ‘Recent Land Use Change in the Western Corn Belt Threatens Grasslands and Wetlands’, PNAS 110 (5 March 2013): 4134–9, doi.org/10.1073/pnas.1215404110.
cover brought more erodible soils into cultivation. As a result, there was decreased soil capacity, declining carbon sequestration, increased sediment transportation into wetlands, changed surface water hydrology, increased peak flows and modified stream morphology.\textsuperscript{49}

The 49,210,000-hectare Nebraska Sand Hills is the largest sand dune area in the western hemisphere. However, it enables irrigated agriculture because the Sand Hills contribute 30 per cent of the recharge water for the High Plains Aquifer underlying the western Corn Belt. Research has demonstrated that the natural grassland cover supporting extensive grazing is protective and resilient. If physically removed, wind erosion occurs at rates up to 1 metre per year. When left in place, even if drought desiccates above-ground plant parts, the below-ground ecosystem minimises sand movement. There is a residual buffering effect even after it, too, succumbs. Replacing native grasses with trees resulted in soil moisture depletion to greater depths. Research results further supported suggestions of strong feedbacks on local and regional climate in temperate semi-arid regions.\textsuperscript{50}

Model-generated proposals for cultivating the Corn Belt’s remaining prairie ecosystems have not taken into account the region’s significance for national and international avian populations, regional aquifer recharge, climatic regimes or the complex interactions and significance of below-ground root systems, not only for local soil stability but also for carbon sequestration.

The Russian Federation’s abandoned farmland

The GAEZ model’s identification of the Russian Federation’s abandoned farmland as the third-largest source of global spare land resembles the early optimism for the EU’s self-sufficiency in agrofuels. Projections had been based upon expectations of increased farmland from an expanded EU.\textsuperscript{51} Eastern Europe’s chronically low yields had been attributed to socialism and central planning/management, but closer agronomic analysis demonstrated soil and climate constraints.

According to Grigory Ioffe and Tatyana Nefedova,\textsuperscript{52} Russian farmers face the worst climate factors anywhere in the world. Ninety million of the Russian Federation’s 119 million hectares of arable land are limited by severe winter temperatures, short growing seasons, depth of soil freezing and erratic patterns of severe cold and thaws. Of the total rural land area, 10 per cent is favourable for cultivation, 40 per cent is

\textsuperscript{49} ibid.
\textsuperscript{51} Showers, ‘Land Use from Below’.
submarginal and half is ill-suited. In terms of degree days above 10°C (mean annual daily temperature) and precipitation-to-evaporation ratios, 59 per cent of Russian agricultural production occurs on submarginal land. Thirty-eight per cent of European Russia is marginally cold, and 27 per cent submarginally cold. Sixteen per cent of the arable land has a 70–90 per cent chance of drought, and a third is in semi-arid areas with drought every third year.

From 1980 to 2000, approximately 20 million hectares of arable land were abandoned. Except for the region around Moscow, where land is used for second homes, land abandonment increased at distances greater than two hours’ travel from an urban area. This was particularly pronounced in the lower soil fertility non-chernozem soil zone. With significant investment—from fertiliser to infrastructure construction—and a tolerance for risk of climate extremes, abandoned farmland could be cultivated for biofuels. But this would be without reliability of either production or profits.

Argentina’s Caldenal

The transition zone between central Argentina’s Humid Pampas and Patagonia regions is a phytogeographic zone called the Caldenal. Originally the area was an extensive grassland with isolated bushes and trees. A mutual water-dependent relationship existed between the vegetation and soil in response to the significant variability in rainfall (109–761 mm/year) and elevated evapotranspiration rates (as high as 1220 mm). Roots proliferated in the top 5 cm of soil to enable more efficient use of what rain did fall. The rhizosphere included a dependent microbial community (e.g. mycorrhiza, Azospirillum bacteria), which provided nutrients and increased water availability. The calcareous and, in places, saline soils have pedogenic carbonates and calcic horizons. Because of their low structural stability and texture, the soils are extremely susceptible to wind erosion.

In the early twentieth century, livestock breeders began to establish ranches in the region. By the end of the century, the Caldenal was in an advanced state of degradation and desertification. Intensely grazed, lightly grazed or ungrazed patches had bare soil as a constant feature. The microbial community had also been

56 Paoloni et al., ‘Water resources’.
57 Villamil et al., ‘Soil Degradation’.
weakened by having its food source removed. Animal traffic affected soil structure, bulk density, total porosity and pore size distribution, as well as aggregate stability. These physical alterations, in turn, affected water infiltration rates, water retention capacity, structural stability and microbial communities. Researchers believe that many of the soil changes will not be reversible in the short term. As yet undetermined threshold levels will mark irreversibility.\textsuperscript{58}

Crop cultivation would be restricted by the high levels of calcium carbonate, which decrease the availability of iron, manganese, micronutrients and phosphorus. Groundwater, containing arsenic, sulphates and magnesium, as well as sodium and chloride, is below acceptable levels for human consumption. However, these levels can support livestock once they become accustomed to them.\textsuperscript{59} Much of the region is seriously degraded and the remaining Caldenal vegetation is under threat. Proposed intensified land-use systems would contribute to further destruction.

**Intensifying grazing systems to release land**

Plans for industrial-scale biofuels cultivation in grasslands assume that intensified grazing and livestock management systems will displace existing extensive grazing systems. The theorised result is a release of land for agriculture. The FAO's Alexandratos and Bruinsma conceded that a shift from extensive grazing to stall-fed management would raise the average grain-to-meat ratios.\textsuperscript{60} The imagined ‘freed’ land would actually be required to produce grain for confined cattle, and thus not be available for biofuels cultivation.

**North America**

Feedlots began in the United States in the 1850s to solve a waste-management problem associated with cotton seed oil extraction. Cattle were fed the large amounts of meal and hull by-products in need of disposal. Within 50 years, a separate feedlot industry had emerged. By 2012 the United States had the largest fed-cattle industry in the world.\textsuperscript{61} Expansion caused increasing disconnection from rangeland, making producers responsible for elements that had previously come from ecosystem function. In the most extreme forms, cattle are indoors from birth to slaughter. They require not only food and water supplies, but also climate management. Cattle’s water requirements can be calculated fairly easily. The same is not true for

\textsuperscript{58} ibid.; Bashan and Vazquez, ‘Effect of Calcium Carbonate’.
\textsuperscript{59} Paolini et al., ‘Water resources’.
\textsuperscript{60} Alexandratos and Bruinsma, *World Agriculture: Towards 2030/2050*.
estimating the amount of land required to sustain the livestock. The diversity of feed and fodder is the first complication. The amount consumed varies with animal age, rate of weight gain, and desired meat classification at the end of life. Regardless of size or configuration, all feedlots must have some mechanisms for feeding and waste management.

The pollution potential of feedlots is great. In 1991, Gordon Conway and Jules Pretty calculated that in the United Kingdom the pollution load from livestock was equal to that of 150 million people (about 2.5 times the human population in 1991), and in the United States equal to 2 billion people (40 per cent of the estimated world population). Large-feedlot waste was equal to that of a small city. It was estimated that the nitrogen produced by two thirds of the feedlots in the US Midwest, if preserved and used, could equal 100 kg of nitrogen per hectare for 8.4 per cent of the wheat and maize grown in the nation. How does this North American prairie experience relate to intensified grazing systems proposed for South American biofuels production?

South America

In Brazil, subsidies have favoured establishing large, highly mechanised, capital-intensive forms of agriculture pioneered in the United States. Cattle ranching expanded rapidly on the cerradão savannah in the late twentieth century. By 2003, Brazil had become the largest beef exporter in the world, with the largest commercial cattle herd. However, the feedlots that began to emerge in the 1990s did not follow US environmental guidelines. The first national survey of Brazilian feedlot waste management practices found that on 73 (of 120 contacted) feedlots in seven states, 74 per cent of the respondents could not estimate the amount of manure produced. Twenty-six per cent estimated 2–4 kg of manure per animal per day on a dry matter basis. The most common manure-handling practice was removal from pens only at the end of the 60–135-day feeding period, followed by storage in mounds before spreading on crop and pasture lands. The operators had very little information about the properties of manure and how best to handle it. On this weak experiential and knowledge base comes great pressure to increase the number and size of feedlots.

Land use has been identified as Brazil’s primary source of elevated greenhouse gas emissions. The first source was cutting down the Atlantic coastal forests and the Amazon rainforests for expanded biofuels production (sugar cane). This was followed by transforming the cerrado into agricultural fields and cattle ranching.

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Yet intensification of farming and livestock production has been designated by the United Nations Framework Convention on Climate Change a Nationally Appropriate Mitigation Action. Cattle Ranching Intensification Programs on abandoned and marginal land have been proposed as a land-sparing activity. Proponents claim that increased technology adoption would produce increased crop yields and livestock production per unit of land. This, in turn, would result in decreased demand for pasture and agricultural land, thus reducing deforestation.65

One proposal for the application of advanced technology is Intensive Cattle on Pivot Irrigation Systems, in which cattle are fed no grain, but instead rotated among paddocks of irrigated pasture for 12 months. A 103-hectare circle of pivot-irrigated pasture land would be created on freshly cleared cerrado land, using water from an hypothesised river or well. Lime and phosphorus would be added before planting pasture grass to support 1,100 calves.66 The system requires minimal labour—one person can manage three pivots, and the cheapest land can be used, that which cannot support rain-fed agriculture.67 The cerrado has a six-month dry season, making irrigation essential, yet little thought has been given to the actual sources of irrigation water or water for cattle concentrated in feedlots. Furthermore, there is no mention of waste-management methods. Intensified cattle production with fertilised pastures on extremely well-drained soils with a low ability to retain nutrients could pose a threat to aquifers and nearby surface water, although the soils’ renowned ability to fix phosphorus might mitigate against this form of water contamination.

Ecosystem integrity and function are unvalued, as plans call for environmental transformation to suit industrial scales of production. These completely technological approaches to land use only consider the price of land, soil amendments and labour as costs of production. A central assumption is that by moving biofuels cultivation to lesser-valued (and incorrectly imagined lower carbon content) grasslands, forests will be spared. Ignorance of grasslands’ significant subterranean ecology has enabled the privileging of forest land in terms of carbon storage and environmental protection. Environmental histories of large-scale interventions in grassland ecosystems in other places for other purposes have uncovered unintended consequences. Lack of information about local conditions was always central to the environmental and social disruptions caused.68

65 ibid.
66 Cerrado soils are notorious for their capacity to fix phosphorus, making them unavailable for plant growth. AgBrazil states that ‘fertility on cerrado soils is “man made”, requires extensive modification, and takes time—up to 3 years under some conditions’. AgBrazil, ‘Soils’, www.agbrazil.com/soils.html, accessed 6 November 2015 (site discontinued).
Summary and conclusions

Denying both the finiteness of the earth’s surface and the importance of functioning ecosystems to human existence has been central to the promotion of biofuels as a response to mitigating carbon emissions. This was enabled by the simplified world of globalised statistics. The GAEZ model family has been used to analyse alternative uses of land at a global scale. Different versions and parameter selection produced both maps of economically defined marginal land on the African continent and tables of newly defined global spare land.

Although conveniently homogeneous for the purposes of national and global levels of discussion, modelled landscapes do not reflect the significant particularities of local places, which is the scale on which all crop production occurs. Both the World Bank/IFPRI’s African Guinea Savannah Zone and IIASA/FAO’s global spare land are simply rearrangements of databases and models based on self-referencing—and insular—citations. The modelled and mapped African Guinea Savannah Zone, that is easily downloaded from authoritative institutional websites (including those of IFPRI and FAO), apparently documents the often-repeated colonial claim of large amounts of unused African land ready for agricultural exploitation.

To avoid the food-versus-fuel debate, GAEZ v.3.0 was used to promote third-generation biofuels. In response to criticism that earlier versions of GAEZ had identified the Amazon and Congo River basin rainforests as potential arable land, version 3.0 selected the world’s endangered grasslands as available non-agricultural land. Even the most superficial environmental histories of the selected regions demonstrate complex ecosystems and biomes whose values have not been recognised by industrial societies. Many of these regions have soils with severe constraints for agriculture, unreliable and largely inadequate rainfall, and harsh climates. Most have been used for centuries, if not millennia, by indigenous people. Where intensified land-use systems have been introduced, soils have been exhausted or destroyed. With expansion, entire biomes would be threatened.

The world’s grasslands have greater significance than as potential venues for biofuels cultivation. Research is beginning to document the richness of their rhizospheres, the importance of soil–plant interactions for sustaining these biomes, and grasslands’ significance for climatic feedback systems and extensive carbon storage. Because they are the least understood, they are the least valued and the least protected ecosystems in the world. Yet their loss would have grave consequences. Once destroyed, they cannot be restored, and the earth and its processes will have been changed fundamentally—at local, regional and global scales.

Third-generation biofuels are amenable to computer modelling because the industrial systems proposed to obliterate, rather than respond to, local environments. Technological interventions are designed to replace biological processes. In such
systems, the most important soil qualities are tolerance of large and heavy implements, and drainage sufficient for irrigation. Rather than being complex bodies, soils are reduced to easily modified mediums for plant growth, and cattle to stationary, rapid protein producers. This approach, already causing problems and distortions on richly endowed American prairie soils, will certainly induce imbalances in more fragile soil–plant ecosystems. The long-term and indirect consequences could echo crises associated with other international agricultural development projects, and confirm the environmental fears of the Mozambican farmers who resisted industrial agriculture in their grassland ecosystem. Model-identified potential exists only in a terrain of pixels, and it is only on this socially constructed landscape that third-generation biofuels could thrive.

It is possible to abandon the destructiveness of globalised statistics’ simplified world view—and it is essential that we do so. The actions of human beings have so transformed the surface of the earth that all biogeophysical processes have been profoundly disrupted. Many local and regional feedback systems fundamental to global processes have been severely damaged, if not completely destroyed. This began on a small scale, but accelerated as advances in technology changed human capacities for intervention. Mitigation cannot be implemented at a global scale. It can only happen at a local level, where individuals, institutions and communities take actions to restore or protect their soil and water systems. It will be the cumulative effect of local actions that will begin to ameliorate local disturbed ecosystems. These will feed into larger regional and, ultimately, global systems and processes. If the global earth crises we are now facing are the cumulative effect of discrete, local destructive steps, mitigation can only be achieved by the reverse: the cumulative effect of discrete, local restorative measures over significant periods of time.

Biofuels can provide an alternative to fossil fuels, but applying an industrial approach to their production simply continues the destructive logic responsible for global degradation. When included in soil-conserving farming systems, biofuels could supply local fuel needs. Small-scale production would not only create local self-sufficiency, but also reduce local demand for fossil fuels. If linked to strongly reduced electricity consumption, then not only local, but regional and global consumption of fossil fuels would be reduced. Rivers further threatened by dams could be protected. A new ethic is required. Developing and acquiring new technologies that increase humanity’s separation from itself as well as from the earth must be identified as destructive, while consuming less, wasting little and becoming reconnected with nature should be promoted as primary goals.
Abstract

This article examines the history of British huntswomen in colonial India, c. 1890–1921. It aims to map the dissemination of the codes of huntswomanship, which came to signify the cultural and political ecology of India, in relation to historical geography and the animal kingdom. This study argues that British women could not have gained such an ideological significance without the active collaboration of indigenous people. In addition, this article contends that British huntswomen’s environmentalism and the hunted fauna differed widely from those of male imperial hunters—an important historical development in relation to shikar in India that extant historiography has overlooked. Taking into account the memoirs of Mrs Alan Gardner, Isabel Savory and Mrs W. W. Baillie, this study offers a different reading of the history of huntswomanship in colonial India beyond the male-dominated genre of the imperial hunt. While tiger huntresses existed in the English East India Company period, in the later Raj, more British women successfully transformed big game hunting mores by positioning their practices in the realm of sport. These women conceptualised gender hierarchies and intelligently articulated their views on the hunt, as well as hunting fauna, through a colonial feminist perspective. Finally, the analysis sheds light on the political dimensions of huntswomanship and the implication of gender politics in the context of environment and empire.

Keywords: India, women, hunting, gender, environment, imperialism

This article will explore the semantics of ‘huntswomanship’ that took place in the British Raj, from 1890 to 1921. With the onset of colonisation, many British women took to hunting adventures across the British Empire. Just why did British women risk their lives by venturing overseas to hunt? The possible answer is that ‘huntswomen’ who made their debut in the colonial world consciously took to dangerous pursuits of big game hunting in order to overcome the physical and mental restrictions imposed by society. Members of the male fraternity in Victorian Britain were less enthusiastic about women entering the masculine spheres of ‘exploration’ and adventures in big game hunting in tropical places. Kenneth Czech points out that men in the business of exploration and big game hunting were expected to earn fame and fortune, receiving generous sponsorship and writing
books on their adventures and discoveries, while discounting women’s contribution in similar fields.\textsuperscript{1} The privileged women who could participate in such adventures were tolerated in the subaltern role of ‘wife, guide, or servant’, but not as equals.\textsuperscript{2} George Nathaniel Curzon (1859–1925), Viceroy of India from 1899 to 1905, opined that women’s ‘sex and training render them equally unfit for exploration, and the genus of professional female globe-trotters … is one of the horrors of the latter end of the nineteenth century’.\textsuperscript{3} The then Secretary of the Royal Geographical Society (RGS), Sir Clements Markham, expressed a similar view. The esteemed institutions such as the RGS and the Royal Scottish Geographical Society (RSGC) in Britain denied women entry into their organisations and refused to allow them to undertake any kind of exploration abroad.\textsuperscript{4} When he was in charge towards the end of the nineteenth century, Curzon fiercely opposed the admission of women into RSGC.\textsuperscript{5}

Notwithstanding such a hostile climate, many women managed to visit the colonial world either by accompanying their husbands or by making individual visits as explorers or adventure-seekers. Such overseas trips presented them with unfamiliar big game opportunities. Czech points out that the scientific desire for exploration indeed opened up hunting ventures in the natural world: ‘Collecting game for science meant understanding the nature and habitat of animals, as well as exhibiting personal courage to shoot animals’ of predatory kind and having trophy value.\textsuperscript{6} Taxidermy flourished, and the number of natural and zoological museums in London, and Europe in general, increased thanks to myriads of sportsmen profiting from hunting undertakings in the empire.\textsuperscript{7} It is against this backdrop that this article will examine the contributions of British women in the field of shikar and the Raj, and how gender and imperialism played an important role in mapping the geographies of empire, thereby producing a feminine understanding of the Indian environment.

While the existing historical literature is valuable in throwing light on the presence of British huntswomen in colonial India, it nevertheless stops short of analysing women’s hunting practices more closely. This literature was reviewed in a previous article pertaining to British huntswomen, during the period of English East India Company rule in India (1830–45).\textsuperscript{8} Some of the research questions this study will

\begin{enumerate}
\item ibid., 4.
\item ibid.
\item ibid., 3.
\item ibid., 4.
\item ibid., 5.
\item ibid., 5.
\item ibid., 4.
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explore include how and when did the idea of ‘huntswomanship’ emerge in the Indian hunting field; to what extent was the doctrine of imperialism entrenched in the psyche of British huntswomen in the nineteenth and early twentieth centuries? Accordingly, our study will closely examine the following aspects: (a) the idea of ‘huntswomanship’ in colonial India; (b) the physical hardships faced by huntswomen; (c) British women’s construction of the cultural geography of the wild; (d) the political dynamics of huntswomanship in relation to British imperialism in the hunting field; and (e) the critique of pot-shooting and indiscriminate slaughter, from a huntswoman’s point of view. By locating these aspects in the historical milieu, I hope to show how British huntswomen, successfully or otherwise, engaged with the natural ecology of the Orient. This study also considers what their hunting practices would mean in relation to shooting big game species as well as the gender politics of the colonial hunt in the late nineteenth and early twentieth centuries. Such an appraisal will help the reader to appreciate the intimate relationship that existed between human societies—whether coloniser or colonised—and the natural environment in which they lived. It would also map the transformation of such a relationship into a compelling hunting discourse, both ‘imagined’ and ‘real’, based on British women’s experience of venturing into India’s forest interiors and mountain altitudes, and their face-on encounters with wild fauna, including dangerous beasts. This article aims to offer such an analysis by examining the hunting memoirs of Mrs Alan Gardner (née Nora Beatrice Blyth; hereafter Beatrice Blyth), Isabel Savory and Mrs W. W. Baillie to demonstrate the possibility of reconstructing the history of huntswomanship in colonial India beyond the male-dominated genre of the imperial hunt. A brief note on the existing record about women hunters is necessary to understand the shape of the discourse. I could not find any particular source relating to the social background of the huntswoman Baillie, except that she was economically a well-to-do member of the British community in India. Beatrice Blyth was the eldest daughter of Lord Blyth of Blythwood in Britain, and her husband Alan Gardner was a member of the British Parliament.9 Blyth and her husband undertook sporting adventures in northern India in October 1892. Isabel Savory was born in Weybridge, Surrey, in 1869. By 1886, her father, a goldsmith, had a personal estate that was estimated to be worth £114,000, attesting to her wealthy background since childhood.10 While Baillie was the wife of an ‘Anglo-Indian’ official and resident colonial, Gardner and Savory were wealthy sports tourists who travelled the country for months and years and identified themselves as ‘Anglo-Indian’ (i.e. Britons in India) in their writings. The rationale for choosing the above women as the specific focus of this study is to explore how the intersection

9  Czech, With Rifle & Petticoat, 25.
of class, race, imperial power and gender privilege transcended the realm of hunting in colonial India. This is warranted, especially given that hunting was recognised as a restricted domain of male Britons on the upper rungs of the colonial ladder.

Referring to gendered negotiations in relation to hunting and colonialism in the late nineteenth century Nilgiris, M. S. S. Pandian writes that Britons in India used hunting to affirm their ‘superior self’ through the legitimisation of colonialism, where ‘self was presented as risk-taking, perseverant’ and without fear, epitomised by a superior masculine empire and imperial hunt. In colonial India, this was juxtaposed with and contrasted to the native practices of the hunt, which were branded ‘utilitarian’ and ‘effeminate’. Pandian contends that the process of affirming such masculine–feminine/coloniser–colonised differences, in reality, faced much rough weather in the cultural and political ecology of actual practice. Pandian’s research illustrates that the alleged ‘effeminate’ natives exhibited credible deeds of manliness in the hunting expeditions in the Nilgiri Mountains of the Western Ghats. In reality, the process of affirming masculine–feminine/coloniser–colonised differences also reinforces the frailty of the imperial masculine self in colonial hunting episodes, though this was not put in writing or otherwise publicised.

Likewise, in the following pages, we shall explore the historical instances of the asymmetrical power politics played out by a few notable British huntswomen, who orchestrated the notion of imperial femininity in the Indian hunting field as a negotiating strategy contrasting the dominant masculine sphere of the Raj. Moving beyond the paradigm of prominent British women participating in the hunts, our study also will examine to what extent the succeeding generation of British women changed the field of big game hunting, based on their first-hand experiences and their language of the hunt in relation to the hunted fauna. More importantly, notwithstanding the tiger huntresses in the Company Raj, this study intends to examine how the codes of huntswomanship came to the fore within different territories and environments in the last decade of the nineteenth and the early twentieth centuries.

Blyth’s letters written while she was out hunting and travelling in northern India are a useful point of entry to examine the scope and extent of British women exercising their role in the hunting field in India. When Blyth travelled to India with her husband in the winter of 1892, her letters to her father unveiled the sporting opportunities that India offered to people like her, and especially her role

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12 Pandian, ‘Gendered Negotiations’, 239.
13 She referred to herself as Mrs Alan Gardner; Czech, With Rifle & Petticoat, 25–6.
as a huntswoman—a privilege, much like with the Eden sisters, reserved for only a few European women during this period. As a huntswoman, Blyth was aware of the need for carrying warm clothing in the foothills of the Himalayas, the region famed for hill sport during the heyday of British rule. Her journey from Bombay (Mumbai) to the Himalayas, passing through different territories and environments of varying ‘degrees of cold and heat, from the frost and snow’, required her to carry a considerable assortment of clothing. Savory (discussed above) likewise typified colonial sportswomen by wearing a hat (topi), shirt, hunting coat, woollen gloves and mountain boots, thus leaving behind the prettification of the other ‘Anglo-Indian’ women and adapting her attire to the pressing necessity of moving freely in the forest and facing dangerous animals. One of Savory’s big game hunting illustrations titled ‘With my last barrel I fired’ shows the huntswoman’s outfit she wore when shooting a tiger from the top of a tree near the Godavari basin in the Deccan region. Mary A. Procida’s argument that the sporting environment of the Raj necessitated a change in British women’s attire by ‘modifying their physical appearance to facilitate participation in hunting and other sports’ is persuasive in this context. In a way, the sportswomen’s apparel simply redefined women’s notions of ‘femininity and gender difference’, and thus did not abandon it.

During her hunting journeys, Blyth acknowledged the indispensable role of the native head shikari, on whom depended the Britons’ comfort in the camp, as well as all prospects of bagging game. He was a combination of the ‘major-domo and courier, and in addition commandant of the twenty-five or thirty coolies who carry the baggage’. Czech also points out that the colonial huntswoman’s ‘trust in her shikaris [hunters] grew with familiarity and their trust in her shooting prowess’. This compels the reader to appreciate the exchange of the local knowledge systems of hunting and the whereabouts of the haunts and habitats of flora and fauna. It was reciprocated in a situation where a huntress was expected to demonstrate her mastery of the use of the gun in bringing down the game, thus impressing her native servants

14 Eden sisters refer to Emily Eden and Fanny Eden who were sisters of the Earl of Auckland, the Governor-General of India between 1836 and 1842. Both Eden sisters accompanied their brother to India in 1836, and spent many years in Calcutta and the Bengal Presidency. Their experience in India comprises participation in many tiger shooting expeditions, descriptions of India’s big game animals and the country’s flora and fauna, which took place between 1836 and 1842. See Janet Dunbar, Golden Interlude – The Edens in India 1836–1842 (Boston: Houghton Mifflin Company, The Riverside Press Cambridge, 1956).
15 Alan Gardner, Rifle and Spear with the Rajpoets: Being the Narrative of a Winter’s Travel and Sport in Northern India (London: Chatto and Windus, 1895), see Preface.
16 Gardner, Rifle and Spear, 11.
17 ibid., 12–13.
18 Isabel Savory, A Sportswoman in India: Personal Adventures and Experiences of Travel in Known and Unknown India (London: Hutchinson, 1900), 139.
19 ibid., 266.
20 Mary A. Procida, Married to the Empire: Gender, Politics and Imperialism in India, 1883–1947 (Manchester: Manchester University Press, 2002), 143.
21 ibid., 33.
22 Czech, With Rifle & Petticoat, 55.
and spectators in the vicinity, and concluding the outcome of a hunt on a successful note. An underlying aspect behind such effective organisation of colonial big game hunting expeditions comprised the native servants and shikari helpers.

It would suffice to say that the participation of indigenous guides and informants, and their knowledge, constituted the critical apparatus that the British women appropriated for the successful completion of their hunting missions, even though native assistants were not the intended targets or audience for their shikar triumphs. Shafqat Hussain’s study ‘Forms of Predation: Tiger and Markhor Hunting in Colonial Governance’ offers direct insight into Britons’ ambivalent attitude towards the exploitation of native servants in the hunts in the Kashmir state of India, because it contradicted the codes of sportsmanship and principles of Britons’ enlightened governance. As Hussain explains, though begar or ‘forced labour of local people’ was meant for bureaucratic works of the Kashmir state and British Raj officials, in reality, it became a mandatory requirement for hunting expeditions of British sportsmen in the northern hill region, i.e. Kashmir. While the British officials as well as the sportsmen were hesitant in using begar for their works and hunting expeditions, they accepted the fact that the system was too ‘oppressive’. There were points of tension too. A colonial officer, W. Lawrence, reported that native servants who did not engage in begar, because it entailed service away from their homes for two or three months, had cruel punishment meted out to them by government officials. Such frequent affrays annoyed the British since they violated the ‘liberal political principles upon which the wide discourse of governance was based in which the British recognised their Indian subjects to possess some political rights’. It was estimated that towards the end of the nineteenth century ‘more than half the population of Kashmir of 840,000 was eligible to provide begar’. This is germane to our study as the natives employed on Blyth’s and Baillie’s hunting expeditions in the Himalayas could have been part of this manipulative system. Though British huntswomen did not say much about them, they nevertheless utilised such services in their shikar expeditions.

As a huntswoman, Blyth made several observations regarding the art of stalking and shooting sambar (the largest species of deer in the subcontinent). According to her, ‘there is a charm in stalking the wild animal’ because, in the jungles of India, sambar is found wild and is notoriously secretive, in contrast to the stags of the Scottish forests. While wind direction is paramount to the bagging of a sambar

24 Ibid., 1229, 1214.
25 Ibid., 1231.
26 Ibid., 1229.
27 Ibid., 1231.
28 Ibid., 1229.
29 Gardner, Rifle and Spear, 50.
or deer, the vastness of the Indian forest enabled a hunter to approach the animal unhindered. The difficulty of big game hunting in India was echoed when Blyth pointed out that ‘there is no gillie [sic] to observe that you will drive the beast on to a neighbour’s forest’, as in Scotland. According to her, stalking stag as an art was far superior in Scotland, whereas in colonial India one could ‘circumvent the stag on the ground which renders a scientific stalk possible’.30 What Blyth is implying here is that in India the stags lived in a forest, not only by name but in reality in ‘an endless wilderness’ that offered an exciting chance for sport, in contrast to the highland hunting moors in Britain.31 The sambar’s appearance during early morning and before nightfall, when the animal would come out to feed near its favourite haunts, was considered the exact moment for a huntswoman to get a fair shot. Blyth accordingly observed that ‘with patience and luck this may succeed, but it can hardly be called real sport’.32 The implication here is that the ‘true sport’ could be found in the wilderness of India, where animals are found in an untamed state. Tracking an animal in its natural habitat in India thus obliged a huntswoman to sit unwearyingly for many hours stalking, not to lose nerve or sight, before shooting the animal. This masculine aspect or trait was something considered not suitable for British women in the nineteenth-century political practice of sport.33

The above account elucidates Blyth’s interpretation of the historical practice of stag hunting in mapping out its complex topography and the sporting possibility of gaining an exotic trophy. The sambar was valued for the size of its antlers, and characteristics such as its swiftness and adaptability. Sambar could run in the mountain habitats with long and high bounds, clearing obstacles or rapidly ascending steep slopes with high and low jumping. The latter part of the nineteenth century also witnessed the proliferation of hunters seeking animal trophies of a specific kind, emulating the popularity of stag hunts in Victorian Britain. It is the trophy value of horns and secretive habitat of the sambar that made its pursuit daunting. A sportswoman required knowledge of topography and climatic conditions, as well as great patience and intelligence to track the animal’s whereabouts. The territorial implication of hunting stags is noteworthy too. The language of sport used by Blyth tells of the expansion of control and access to land and resources by British women (the likes of her and other sportswomen in the British Raj). Such females engaged in hunting through their articulation of colonial knowledge applied to wild animals and their environments (for example, in this context, Scottish and Indian deer, and their territorial distinctions). This manner of building colonial political ecology, it could be argued, was a by-product of British utilitarian principles. Such ideological underpinnings of colonial environmentalism aided the British huntswomen in bringing a certain narrative of order out of chaos, which was embedded within

30 ibid.
31 ibid.
32 ibid.
33 ibid.
a local ecological system, whether in India or other parts of the colonial world. In the above account of Blyth’s, the interplay and position of sambar hunting gets central attention in reading imperial interactions with animals (non-human realms) and how it developed further into a conscious act of sport by the later nineteenth century. Such an inventive tradition of the articulation of sport in relation to British huntswomen’s practices implies the flourishing of colonial modernity on the fringe of empire. Besides, the embodied historical geographies of stag hunting at the height of empire also delineate spatiotemporal territorialisation in the interwoven histories of Britain and India.

Blyth’s itinerary with her husband and the rest of the hunting party, including native shikaris and other assistants, necessitated setting off before sunrise, around 2 am, to the Kashmir maharaja’s preserve, a 10-mile ride across the valley, on the opposite hills. With the aid of lanterns, the party pushed along the mountain track at a good pace on the back of ponies, keeping up with the native shikaris’ long strides, reaching the foothills where animals such as the black bear and barasingha (swamp or marsh deer; *Rucervus duvaucelii*) were to be found.  

Blyth’s huntswomanship skills were significant for her time, given that not many British women dared to venture into the rugged terrain and risky mountain ranges at the highest altitudes in search of the Himalayan sport. In British women’s hunting lore in colonial India, the study of animal behaviour and its physiology became crucial in relation to the hunted fauna to justify its killing as worthy of sport.

Like male hunters, Blyth did not fear the pursuit of the Himalayan hill game, because such trails necessitated her to climb dangerous tor steeps and ravines. Despite the fact that her native shikaris ‘occasionally slipped up or tumbled over stones hidden in the darkness’, Blyth managed to reach the location of the anticipated hunting operation. These instances illuminate the kind of physical stamina required by a huntswoman in the pursuit of hill game. Blyth’s field notes also reveal the pitfalls of big game expeditions. For example, in colonial India many beaters or coolies were often severely wounded when they were in the process of driving the game towards the hunter or huntress. Often such men accidentally got attacked or killed by the predatory animals.

Another aspect of Blyth’s hunting discourse was the weather factor, as her outings in northern India took place in the winter season. On one of her hunting trips, walking in the snow became difficult for her hunting party. Everything was ‘frozen’ and her native shikari assistant warned that if there were to be a heavy snowfall

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34 ibid., 51.
35 ibid., 53, 57–63.
36 ibid., 66.
37 ibid., 62.
they would not be able to cross the hill pass at all.\textsuperscript{38} The high-altitude tors of the Himalayas, with its difficult topography, prevented the ponies from climbing any further. Consequently, they were sent back. The hunting party that was left behind reached the peak on foot.\textsuperscript{39}

Once while trailing tahr (Himalayan chamois; \textit{Hemitragus jemlahicus}), Blyth aptly described the difficulty of hill sport as a tough, enduring ordeal in climbing an extremely steep hill.\textsuperscript{40} Such physically testing hill sport required tremendous stamina in the quest for the virile and dangerous nature of big game hunting in the colonial world. This instance of hill sport in the mountains and the role of historical geography could extend our debate on gender and imperialism in relation to parallel developments taking place in Britain around this time. Melanie Tebbutt’s study on ‘Rambling and Manly Identity’ in Derbyshire’s Dark Peak in the Peak District of England from the 1880s to the 1920s elucidates how walking in this particular topography and the moorland area contributed to a localised sense of spatiality, which was influenced by regional and national discourses that also testified the broader social and cultural undercurrents of gender and class.\textsuperscript{41} She refers in particular to G. H. B. Ward (1876–1957), who was popularly known in the Peak District as the ‘King of Ramblers’. Through his writings, Ward created a movement to gain public access to moorlands and he himself was a pioneer of walking ‘on and around outlawed Kinder Scout’.\textsuperscript{42} It is noteworthy that women were not allowed in the walkers’ club until 1904, even though some were elected on an honorary basis.\textsuperscript{43} Ward considered women to be ‘second-class walkers’. Besides, walking in the Derbyshire peaks was denied to English women until the early twentieth century.

This historical development is germane in relation to Blyth’s spatial temporality in her hill-shikar adventures in the high altitudes of the Himalayas in the 1890s, as she was able to exert her physical prowess in climbing dangerous mountains. It is quite puzzling though that British men’s discourse on imperialism and masculinity in colonial India does not speak of restraining women’s involvement in big game hunts. Besides, it does not offer a clue (or one is yet to be found) regarding their silence on the question of female participation in imperialism. The privilege allowed to Blyth under the ruling-race sanction offers a contrasting example of how her ability as a huntswoman helped her to overcome gender barriers in the imperial situation.

\begin{thebibliography}{99}
\bibitem{38} ibid., 67.
\bibitem{39} ibid., 68.
\bibitem{40} ibid., 105.
\bibitem{42} ibid., 1130.
\bibitem{43} Ibid., 1136–7.
\end{thebibliography}
least in the hunting realm and other colonial procedures. Hence, Blyth prevailed over her female counterparts in Britain on the question of spatiality in the hills that British ramblers such as G. H. B. Ward asserted only belonged to males in England.

Unlike the majority of her women contemporaries, Blyth embarked on hill sport and shot wild bears. However, she could not shoot the Himalayan stags, though she pursued them in difficult terrains and environments. Thus, dangerous big game pursuits during this period were not the exclusive domain of male hunters, but women too could participate in the quest for exploration and hill-shikar, a sub-variety of big game hunting in the hills thus far overlooked in the extant historical scholarship.

Besides, Blyth's colonial privilege afforded many opportunities to join and converse with Indian princely rulers of the Rajputana states, and even to display her shooting prowess in their presence. For example, when she reached the kingdom of Chamba in the foothills of the Himalayas, she was able to experience the maharaja's hospitality. There she came across a pond with several tame and wild ducks, the latter being migratory species that visited the region in winter. Blyth found the maharaja's palace rooms filled with pictures of native life, including 'long processions of soldiers, horses, and elephants, or shooting scenes, with peculiarly ferocious-looking tigers'. On one occasion, Blyth shot a leopard in the presence of the maharaja and the gathered public, which offers an interesting insight into the internal dynamics of symbolic hunts in the princely states. For a British woman to establish her credentials to claim ‘imperial race’ privilege, on such occasions it seems she was expected to demonstrate her markswomanship skills. When the maharaja of Chamba and his brother Bhurie Singh invited Blyth and her husband to a public gathering in the capital, the episode was described thus:

The Maharaja handed me a rifle, and begged that I would take the first shot. It was a nervous moment for an inexperienced markswoman [like me] before so many spectators, but he would not hear of a refusal [from me]. The cord was pulled and the leopard bounded out, then crouched seemingly level with the ground, and glared round, gnashing his teeth and lashing his tail, evidently hesitating which direction to take. I fired, and they all politely declared he was hit [i.e. despite it seems Blyth being initially unsure of having hit the leopard].

Afterwards, watched by horrified spectators, the leopard with a roar slouched away in the direction of the hills. The maharaja, his brother and Blyth's husband fired their shots at the leopard in quick succession, and then the animal ‘rolled over motionless’. The vindictiveness involved in shooting a carnivore was supplanted

44 Gardner, Rifle and Spear, 123.
45 ibid.
46 ibid., 128.
47 ibid.
by the rituals of protocol and public spectacle. It is unsurprising that British women were accorded such an honour by their Indian princely hosts for the reason of colonial protocol; such friendly occasions no doubt at times, as Blyth’s experience would seemingly suggest, also provided a platform for British women to demonstrate their ‘markswomanship’ skills in front of an enthusiastic crowd. Later Blyth affirms: ‘part of my bullet, a little .450, was found in his [leopard’s] body, so I had the satisfaction of knowing that I really had not missed’.

It is a well-known fact that sport in India was the social glue for diplomatic and military activities, linking princely states to the Raj. Blyth’s participation in the aforesaid public business of the hunt, on the other hand, exemplifies the licence allowed to British women thus far in the context of gender and imperialism. Such occasions also reinforce the shelving of serious political affairs or tensions between the princely rulers and the British. Blyth’s adherence to the colonial protocol underscores the British involvement in the shared political ideology of shikar. Besides, it could be seen as a sustained process in the construction of a reciprocal colonial representation through big game feats in a carefully chosen public platform. As Julie Hughes points out, the colonial hunt did not emerge from a simple dichotomy of British or Indian, nor did colonisers and Indian princes knowingly and unknowingly create ‘a single colonial vision of [the] hunt’. Rather, it was dialogic, making ‘an ongoing production of innumerable conversations—public and private, official and informal’, which consisted of a wide range of actors and varying colonial contexts that produced multiple spheres of knowledge. I emphasise such dialogic production as we have figured out in the case of Blyth discussed above. Even though Hughes’ book frames hunting as predominantly ‘martial’ and ‘masculine’ in colonial India, which is true, our study has evinced that British women contravened such gender barriers under the guise of an imperial agreement.

One criticism directed at British women argues that they were simply appropriating a (British) male discourse of hunting in the later Raj. This study disagrees with such a view, because the British huntswomen’s bioconservation discourse of shikar differed widely in its textual and allegorical practices. For example, a wild boar hunt or a stag hunt in relation to geography and climate, or an intellectual lament for one’s proclivity to shoot a tiger but inability to do so, as has been elucidated in the case studies of Blyth, Savory and Baillie. Their environmental mindfulness of big game hunting shows the distinctive nature of huntswomen’s philosophy and practice. This indeed constitutes a subversive characteristic about women’s participation in hunting during the later nineteenth century, which can be ascribed to the colonial making of multiple spheres of knowledge; on the politics of the hunt, feminist perspectives

48 ibid., 129.
50 ibid., 8.
of the hunt, cultural ecology of India, historical geography and India’s animal zones. According to Pramod K. Nayar, ‘The white woman remained “superior” to the natives by virtue of her race, even if she was, in terms of her gender, relegated to a secondary position in the empire’s scheme of things’. And yet, the recreational interlude of shikar narrowed the rigid stratification among the ruling elite. Hunting was a cultural and political alignment that provided an amiable platform, despite occasional tensions, by governing the socialisation between the class of Englishmen and women and the social status of Indians (i.e. princes, the wealthy zamindars and merchants) they interacted with.

Thus in a way, British women characterised imperialism in the colonial peripheries by showing their big game shooting skills better than the women in Victorian Britain, whose gender roles in metropolitan circumstances did not augur well for the likelihood of such freedom and privilege. Angela Thompsell’s work Hunting Africa: British Sport, African Knowledge and the Nature of Empire is significant in this context. As she points out, the ‘ability of women to participate in big game hunting without risking or having to defend their femininity offers a critical perspective for re-evaluating the masculinity celebrated through … big game hunting and the contemporary appeal of the sport’. Unless we explore the role of women in the hunting field, the construction of all the traits and actions relating to big game hunting in Africa (or in India) will continue to be considered and examined as an archetypical feat of imperial manliness. As an alternative, Thompsell offers a framework that considers that women hunters, too, demonstrate these attributes in terms of ‘imperial femininity’. Her book discusses these instances in the context of colonial Africa in relation to the big game hunting tradition and the emergence of sportswomen in early twentieth century. I would suggest that such developments were reinforced with much more vigour and can be traced back to the days of the Company Raj. Indeed, our discussion thus far on the subject of huntswomen in colonial India has elaborated upon this notion of ‘imperial femininity’ in relation to ‘hunting practices’ in detail. I would suggest that the manner in which gender and imperialism played out on the hunting field produced new types of colonial knowledge systems and codes of huntswomanship on the peripheries of empire.

52 ibid., 210.
53 This is worth noting as Procida also observes that for British women in the Indian empire an independent professional career was unavailable, but empire also equally opened up the possibilities for ‘the development of “unfeminine” interest that would have been limited or unavailable in Britain, particularly in the realm of (big game) sports’. See Mary A. Procida, ‘Good Sports and Right Sorts: Guns, Gender, and Imperialism in British India, Journal of British Studies 40, no. 4 (2001): 465.
55 ibid.
For example, Blyth utilised opportunities for practising pig-sticking as well as actively participating in panther hunts and riding along with her husband in the Rajputana kingdoms of north-west India. On one occasion, Blyth joined the maharaja of Jaipur’s meet for pig-sticking in an area of grassy wilderness 8 miles from Jaipur city. At this place, wild boars took shelter during the daytime in the arroyos and the broken ground near the river. At night these animals would ‘come out to feed on grain placed for them in the rid[e]able grassland’.\(^{56}\) The pig-stickers were expected to be on the ground before sunrise to catch and chase the boars, after they had fed on the grain and were about to return to their haunts. Blyth and her husband, on the backs of horses, holding spears in hand, came across a group of wild boars heading towards grassland jungle cover. In the fierce pig-sticking battle that followed, the couple, along with the rest of the hunting party, galloped after and speared one wild boar after another, killing up to five animals in total. We have to acknowledge that shooting a wild boar with a gun was strictly proscribed in the later British Raj. Instead, pig-sticking became a high-class elite diversion, where ‘horse riding’, ‘horsemastership’ and skill in handling the spear in the chase became signifiers of this peculiar and dangerous sport.

Referring to one of these encounters with a wild boar that chased her horse, Blyth admitted her lack of courage to face up to the ferocity of the animal.\(^ {57}\) In her own account, the huntswoman-versus-wild-predator metaphor was juxtaposed with the reality of the huntswoman not showing up to fight, emphasising the cruel underpinnings of the big game world in colonial India. In the case of Fanny Eden’s friend Mrs Cockerell during the 1830s East India Company rule, this too became apparent, if only the other way around, as she was evidently challenging a tiger for not showing up to fight, as discussed in my earlier article.\(^ {58}\) In the sporting language of Blyth, the characteristics of facing a ‘challenge’, ‘bravery’ and ‘combative spirit’ were ascribed to the furious wild boar, thus even disrupting the hierarchy of the huntress and the prey.

In this context, Callum Mckenzie instances the Revd Andrew Clark in Victorian Britain, a chief contributor to *Baily’s Magazine*, the foremost sporting periodical during this period, on matters pertaining to hunting from 1861 to 1887.\(^ {59}\) Clark fiercely opposed women’s entry to the hunting field. According to him, ‘Women, who hunted, *were not women*.\(^ {60}\) Warning women not to partake in hunting pursuits, Clark went on to say that ‘[t]here is nothing so disagreeable, nothing so distasteful to men, especially hard-riding men, or true sportsmen, as a horsey female. How far

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57 ibid., 271.
58 Mandala, ‘Tiger huntresses in the Company Raj’.
60 Emphasis in the original: ibid.
is woman fulfilling her mission by adopting the attributes of the other sex?\textsuperscript{61} It is worth considering two aspects in this context. First, the fact that Clark objected to women taking part in hunting would suggest that it was indeed happening. Second, even if he did object, there is no available evidence that his objections resulted in women being prohibited from hunting. What we can infer from this discussion is that female sporting activity was often criticised in Victorian Britain, but nevertheless continued. The dominant male society in Britain agreed with such reiterated views. We can substantiate such a claim by reference to the widespread patronage and regular subscriptions \emph{Baily's Magazine} received in Victorian Britain.\textsuperscript{62} This includes hunting and sporting clubs across England during later part of the nineteenth century. Their argument was not only the physical liability women had to face up to, but also the ‘delicacy’ of the female body that was seen as a perpetual hindrance to riding. The male critics further observed that women faced risks to their fragile physique. In the words of \emph{Baily's Magazine} in the 1890s a ‘first-rate horsewoman’ could never equal ‘a first-class horseman’, because women do not have a muscular body or physical stamina like men do.\textsuperscript{63}

Such physical, cultural and sociopolitical barriers imposed by Victorian society in Britain were comfortably disregarded in the colonies—for example, in India. British women in the empire responded to the critique of their hunting by men by taking their embodied personas to the hunting field as well as by articulating their experience through huntswomanship codes. For example, Blyth and Savory by riding on horseback actively participated in very dangerous colonial pursuits such as pig-sticking or the wild boar chase. Savory advised other sportswomen on the safe handling of bamboo spears while pig-sticking riding side-saddle, and the precautions a woman ought to take against a wounded leopard, if it were to cross her path. Although riding side-saddle is a form of equestrian sport, in the case of big game hunting in India, spearing the animal on horseback warranted ‘horsemastership’ and handling the spear with precision against retaliating wild boar. Thus Savory prided herself riding on side-saddle in the sport of pig-sticking in the Punjab region.\textsuperscript{64} In this way, she provoked her readers that she could ride side-saddle in dangerous pursuits such as pig-sticking in India, thus separating the perilous nature of big game hunting from that of equestrian sport in Victorian Britain.

Speaking of pig-sticking, the sportswoman Savory opined that ‘India, and India alone, is the land of pig-sticking’. This peculiar sport ‘stood the test of time better than any of her rivals’.\textsuperscript{65} Savory’s reference to pig-sticking as being ‘better than

\textsuperscript{61} ibid.
\textsuperscript{63} Mckenzie, “‘Sadly Neglected’”, 554.
\textsuperscript{64} McKenzie, \textit{The Right Sort of Woman}, 95.
\textsuperscript{65} Savory, \textit{A Sportswoman in India}, 32.
her rivals’ is interesting as it underscores her attempt to feminise a pursuit known in colonial India as a violent chase of wild pigs or wild boars, involving horse-riding and horsemastership, and using combative skills with a spear rather than a gun. Because of such characteristics, the ‘Anglo-Indian’ sporting fraternity held the view that pig-sticking was not only more ‘scientific’ in terms of testing one’s physical fitness and nerve, but also a more dangerous sport than tiger shooting.\(^{66}\) Savory writes that pig-sticking is *always* wildly exciting, involving features such as breakneck galloping and the battle between a huntress and a wild boar. Due to these peculiar characteristics and the uncertain nature of the chase itself, the wild boar was described as ‘royal, fraught with danger’.\(^{67}\) Savory also warned the nascent huntswomen to train in the art of horse-riding and horsemastership, as chasing wild boar was dangerous, and instances did occur where ‘riders [fell] off their horses when jumping over walls and water’.\(^{68}\) After a harrowing chase involving a wild boar passing through mangroves, a village and sugar cane fields, Savory eulogised the wounded boar as ‘bravest of the brave’ and commended its ‘devilish’ and uncompromising temper.\(^{69}\) Choosing a wild beast worthy of violent sport is one factor that justified the imperial canon of huntswomanship. Precious McKenzie points out that a peculiar romantic tension existed in regard to the figure of the wild boar in the imagination of the huntswoman in colonial India. Thus, Savory, in characterising the wild boar as ‘savage and noble, beautiful and awe-inspiring’, unsurprisingly invokes the metaphor that the heroic Indian boar embodied the very characteristics of the Indian rebels themselves (who had opposed British rule).\(^{70}\)

While Savory admitted that tackling a wounded boar on foot involved greater risk, she believed that a greater number of (British) lives had been lost to the tiger than to the wild boar, attesting to the dangers involved in both tiger shooting and pig-sticking pursuits.\(^{71}\) Both tiger and wild boar hunts involved lurking danger to the life of a huntsman or a huntswoman on many occasions. As more and more woodland territories opened up for Britons, the pursuit of predatory tigers and wild boars smoothed the transition of ‘the countryside to the rule of law and the improvement of welfare only by instantiating the hunter himself as kingly potentate, the personification of sovereign force’.\(^{72}\) Thus, Savory proclaimed, despite the thrill of the chase, these animals offered a spatial temporality across the ecosystem of India. Unlike Savory, Blyth candidly admitted that she did not succeed in shooting any sambar, to her native shikari’s ‘disgust’, nor did she level the fighting spirit

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66 ibid., 29.
68 ibid.
69 ibid.
70 ibid., 96.
against a furious wild boar. Thus, a British woman's big game adventures in colonial India encompassed both successes and failures, underlain by a self-imposed moral framework of huntswomanship, subtly almost elevating her to the status of the codes of the later nineteenth-century imperial hunters.

While we do not know the exact date of the emergence of sporting codes among huntswomen in colonial India, a closer reading of the women's writings discussed in this article would suggest that such regulatory codes were contextualised in the later part of the nineteenth century. In British women's writings, animals such as leopard, wild boar and tiger became a personal focus of colonial imaginations and desires, often symbolising the huntswoman's aura in relation to the animal they hunted. Though animal agency was justified on the premise of colonial adventure and territorial acquisition, the spatiotemporal and embodied practice of the hunt also indicates a closer reading of natural history is possible by rendering interest in the ways in which huntswomen's objectives were accomplished, and often remain unaccomplished (for example, in the case of Blyth and Baillie). Thus, the subtleties of gender and ecology explored in this study illuminate how British huntswomen, animals and the physical environment produced an entity that consisted of highly complicated interrelationships.

The above discussion, focusing on the representations of wild animals portrayed in the accounts of huntswomen, further shows how the competing gender dynamics restructured femininity in the context of environment and empire. Recent scholarship has shown that the culture of masculinity was integral to the empire, and was an important component in defining the historical and social contexts of colonial lives in the British Raj. John Tosh has argued that manliness as a ‘cultural representation of masculinity rather than a description of actual life’ should be seen as a code of ‘empire building’. For Britons in India, hunting was one of the crucial components in realising these colonial goals. As such, big game hunting offered a perfect site for the reaffirmation of British imperial identity and masculine virtues, and came to be governed by a series of both formal and informal regulatory codes that shaped the outlook of the hunting fraternity. Their importance lay not just in moulding the public face of the Raj, but in maintaining strict internal hierarchies within the ruling community. Confrontation with ‘wild’ and ‘dangerous’ carnivores such as the man-eating tiger or leopard, and the wild boar, further reinforced the discernment of the pursuit and masculine virtue among the colonisers. Thus, for Britons in India, hunting codes and practices came to play a critical role in maintaining order and authority, while symbolising imperial power. However, in this article I made an effort to show this gendered sanction of big game hunting was a cognisant and layered one. The idea of ‘imperial femininity’ in the case of Savory

73 Gardner, Rifle and Spear, 292–93, 295.
and Blyth appropriated the same symbolic power structure of the hunt, through chasing and shooting ferocious animals such as wild boar, tigers and panthers in the case of Baillie. Unlike the Company Raj, by the turn of the twentieth century, such kind of huntswomanship semantics and their discursive practices gained prominence in contrast to the imperial masculinity of British hunters, and questioned their exclusive claim to the cultural geographies of empire.

There is also another aspect to a huntswoman's life in colonial India: the production of knowledge of the immediate environment in relation to the changing panorama of the Indian countryside. Blyth, like a typical huntswoman of the period, vividly described her hunting party as a little ‘imperial show’ wherever they marched through the Indian jungles. Her husband and their native shikaris carrying rifles hung ‘themselves with every hunting-knife, telescope, field-glass and other shooting appliance’, and with this escort accompanied the chuprassies, making an ‘imposing little show’ to the villagers in the countryside. In addition, she also witnessed how a number of isolated railway stations away from Calcutta on the way to the United Provinces and in north-west India encountered the problem of tigers in the vicinity, terrifying the stationmasters. As Britons were gradually assuming their role as tiger hunters, a Bengali stationmaster polemically drew a metaphor likening the Gardner couple (Alan Gardner and Beatrice Blyth) with India’s big cat. The stationmaster was referring to the couple requiring a berth reservation for the next inbound train, but equally was suggesting that British hunters too were ‘troublemakers’ no less than tigers. In the later part of the nineteenth century, the railway system under British rule expanded across Indian forest territories. Prima facie, the ones who roamed in such peripheral areas were the British hunters and (until that time) tigers—competing to gain control over forest zones. While the former were European arrivals in search of sport, the latter’s forest habitat and the existence of its species now came under serious threat with the onset ofcolonisation and the rise of big game shooting. Besides, Blyth’s imperial identity was drawn into a metaphor of how Britons and Indian wild animals were symmetrically juxtaposed in the narrative of the station master.

Blyth’s pursuit of urial (a horned mountain sheep with a red fur coat) and doe (deer species) shooting also necessitated her encamping on the edge of the foothills of the Himalayas. This part of the Himalayas is covered with ridges of low hills, where the terrain is cut into long narrow abysses with dangerous precipices, ‘some hundred feet deep, looking as if they had been slashed with a razor out of the solid ground’. The hunter in the pursuit of game had to climb ‘in and out’ of 20 or 30 of these precipices to reach the peaks. Thence followed a urial hunt. Blyth held the

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76 ibid., 147.
77 ibid., 167.
78 ibid.
view that, with fair-minded shooting, urial numbers would not seriously decrease.\textsuperscript{79} Because these animals possessed excellent eyesight, any suspicious object, however far in the distance, would alert them to escape quickly. Unlike the Himalayan ibex or the markhor, the urial was known to be sensitive even to a ‘whiff of tainted air’, and this kept them always vigilant.\textsuperscript{80} Blyth acknowledged that for any British sportsman or sportswoman, the ground the urial frequented was hard to approach without noise. For that reason, they were most difficult of wild animals ‘to shoot fairly’.\textsuperscript{81} On one occasion, Blyth followed the pursuit with her husband and stalked the urial for three days, but shot nothing.\textsuperscript{82} What is interesting in Blyth’s semantics of hill-shikar is the dissimilarity between a British huntswoman’s anthropomorphic observation of the hunted fauna and the British hunters’ sporting language of ‘masculine triumph’ in shooting big predatory carnivores in heroic attempts, the latter disregarding other wild animals they could not shoot.

Contrary to nineteenth-century British hunters’ discourse, Blyth asserted that the non-predatory species such as deer, sambar and the Himalayan wild goats possessed an escape instinct inherent in their thinking, whenever an individual or a group of hunters approached to shoot them. From this discussion, it is possible to infer that many imperial hunters might have had disappointments in their big game shoots on numerous occasions, but they never reported them openly, or publicised such failures in their writings (whereas Blyth and other huntswomen did). Indeed, this aspect demonstrates the colonial dynamics of the high-stakes politics and economics invested in the sport of big game hunting in India in relation to the British huntsmen’s reputation, as opposed to the huntswomen, who were numerically far less in the field.

One of the significant characteristics of British huntswomen’s thinking was their disapproval of indiscriminate shooting, both by European and by native hunters in colonial India. Given this perspective, Hussain suggested that game laws did not exist in early 1890 in Kashmir, whereas the codes governing fair hunting practices were more of a choice among gentlemen within the British hunting community.\textsuperscript{83} Hussain writes that Britons’ adherence to fair sporting practices in the Indian empire was due to the influence of liberal and utilitarian principles derived from Britain and Europe in the nineteenth and early twentieth centuries.\textsuperscript{84} I argue that such

\textsuperscript{79} ibid., 167–8.
\textsuperscript{80} ibid., 168.
\textsuperscript{81} ibid.
\textsuperscript{82} ibid.
\textsuperscript{84} ibid., 117. As Hussian points out, ‘fairness could only be conceived in this way because of a wider social context in Europe during the nineteenth and twentieth centuries in which liberal ideas, based on justice, equality and fairness, became popular. I am not claiming to show how these liberal ideas actually infiltrated into the minds of the sportsmen, rather I am making an assertion that a look into the making of the fair hunting code, say for ibex and markhor, could illuminate the influence of liberal thoughts on it’.
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liberal ideals and the discourse in practice were reserved only for males in Britain until the early twentieth century. Throughout this study, we have seen how women were harshly judged for their involvement in hunting activities in Victorian Britain, which violates the principles of liberalism and enterprise that was publicised in the empire. What would be significant is how women in the empire evinced such ideals in terms of disseminating hunting practices and their expression of sporting codes in governing the cultural ecology of the Raj and its animal kingdoms. It is a parallel concept of fair play that women such as Blyth and Savory enunciated in the cultural geography of India.

For example, Blyth criticised the diminishing numbers of urial, which were otherwise known to be ‘dreadfully wild’.\textsuperscript{85} This horned wild sheep was so much shot in the later part of the nineteenth century that at the sight of a man, even from miles away, they were seen ‘galloping off’.\textsuperscript{86} At this time, Blyth was referring to people in the Nurpur region of Himachal Pradesh in the foothills of the Himalayas, where every small village or hamlet had at least one or two local men in the possession of matchlock guns, who took up the profession of shooting wild mountain goat or Himalayan tahr, fawn (young tahr) and other wild fauna with no conservationist conscience towards species sustenance.\textsuperscript{87} During the hot season, when water was in short supply, the local hunters would sit up all night near the water streams and ponds that had not dried up and would wait to chance upon urial and tahr to shoot when they came to drink.\textsuperscript{88} Local village hunters often killed 10 or 12 tahr at one sitting during their hunts. Blyth lamented that unless the female tahr were to be protected, there would be a danger of the extinction of this species due to the widespread activity of poaching or illegal hunting.\textsuperscript{89} The rationale behind articulating such an ethical sporting code in Blyth’s semantics of shikar was to elevate her huntswomanship credentials, while belittling the indigenous people because the latter lacked the knowledge of fair shooting practices. It could be argued that Blyth was one of the early proponents of conservationist thinking among the sportswomen of later nineteenth-century India. While advocating that the necessary protection must be ensured for the Himalayan wild sheep and goat species, her thinking differed widely from the other hunter-preservationists of the time. Based on her local knowledge of cultural geography, Blyth believed somehow these animals possessed a natural instinct to escape the onslaught of hunters and their indiscriminate shooting practices. She echoed such environmental thinking as necessary for the continuation of the future sport of hunting.

\textsuperscript{85} Gardner, \textit{Rifle and Spear}, 167.
\textsuperscript{86} ibid.
\textsuperscript{87} ibid.
\textsuperscript{88} ibid.
\textsuperscript{89} ibid.
The huntress-preservationist thinking among British women discussed above was significant for its time. First, it tells the story of how British women positioned themselves in the realm of big game hunting and the complex ways in which humans and wild animals were categorised in relation to the cultural and political ecology of India. Chris Philo and Chris Wilbert observe that across the colonial world, European hunters (or huntswomen) placed different animals into varying categories according to their impression of the species, their usefulness, their domesticity or untamed state, and their predatory or non-predatory physiognomies. This categorisation can be interpreted as ‘contested orderings’ where animals were assigned to particular places and spaces. The writings of Blyth, Savory and Baillie examined in this article clearly illustrate how the spatiality of human–animal classifications took place in different territories and environments in colonial India, including the difficult Himalayan geography. Like the discourse of imperial hunters in the colonial period examined by James Ryan, the British huntswomen’s semantics of hunting and environmentalism too were permeated with human–animal relations that were ‘mediated by a range of cultural practices and formed through a spectrum of spatial settings and processes’. Thus, the British huntswomen’s ecological understanding of empire, their construction of ‘wilderness’ and the ‘ferocious’ nature of predatory and non-predatory big game species, and of forest woodlands and hill topographies were defined as a ‘space outside of human civilisation, forged through discourse of hunting’. Such kinds of ecological insinuations inform the reader about the diverse kinds of relations that existed between the colonisers, the subject populace and the historical geography of the natural world.

Another aspect to consider in this regard is the history of displacement and usurpation that colonialism and big game hunting brought to the lives of the local communities. Thus, Blyth criticised the local inhabitants for shooting wild animals for the pot: ‘Naturally they (the urial) are the first victims of the pot-hunter’. She referred to the barasingha or twelve-horned swamp deer, one of the larger deer species in India, which were shot in such a numbers in the mountain valleys that game laws were put in force to protect the species from the 1890s onwards. Blyth observed that the hinds as well as stags were killed ‘in and out of season’. In the winter, a number of them were frequently mobbed to death in the snow by the Himalayan villagers. Subsequently, the new game regulations prohibited shooting

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91 Ibid., 9.
93 Ibid.
94 Gardner, Rifle and Spear, 167.
95 Ibid., 49.
96 Ibid.
97 Ibid.
the hinds by instituting a close and open season, and banning the sale of deer horns and skins in the winter months by proclaiming them ‘illegal’. Thus for British women in colonial India, huntswomanship encompassed shooting wild animals as fair sport with regard to species sustenance. The advent of colonial game laws simultaneously representing huntress-preservationist thinking, as elaborated by Blyth, also underscores the governing ideologies of the Raj, appropriating cultural geographies and ecologies of India during the 1890s.

Likewise in the late 1890s, Blyth’s successor Savory, out on her expedition to shoot tigers in the Godavari River basin in the Deccan plateau, blamed the native shikaris for pot-shooting. However, she confessed that big cats such as tiger or panther, and animals such as bear, had never been shot by them, thus substantiating the aspect of British monopolisation of dangerous pursuits in the Indian forest territories during this historical phase.

In Mysore there are strict game laws, but in Central India there are none, and the native village shikaris are rapidly ruining the country. These shikaris shoot simply for food; and as they kill hinds, does, young, etc., indiscriminately, [as a result] there are no deer left [for the continuation of ‘sport’ of hunting]. They avoid tigers, panthers, and bears, as a rule, partly because their guns would seldom kill them and they themselves would run the considerable risk, partly because these animals are of little use for eating purposes.

The above information offers direct insight into the colonial forces at work with reference to how British huntswomen critically needed the local people to validate their imperial credibility. It also underscores the British huntswoman’s ‘protector/benefactor’ role in the fabricated display of conservation thinking, pronouncing her control over magnificent beasts like tiger, while deliberately casting indigenous hunts as poor and utilitarian. Employing native shikaris and helpers in big hunts and taking their assistance in shooting dangerous carnivores also underlines the British sportswomen’s ability to diminish the agency of Indians in their own forest topographies. In so justifying their hunts in rational semantics, the British women (much like the British men) successfully depended on law and legislation, on the one hand, to disarm the village and tribal populace, and technological advantage of firearms and codes to govern hunting practices, on the other.

As Nicolas Proctor, in his study on the southern settlers in colonial North America in the antebellum era (c. 1820–60) points out, the ideas emerging out of high-end hunting culture demonstrate how white hunters, while economically appropriating the hunting exploits of meat, hides and furs, had also equally ‘used the hunt to

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98 ibid.
99 Savory, A Sportswoman in India, 279.
communicate ideas of gender, race, class, masculinity, and community'. Hunting was also used as a mechanism by white hunters to display their capacity 'for mastery over women, blacks, and the natural world'. In a further effort to distinguish themselves as noble sportsmen, many members of the white elite began redefining previously acceptable methods such as 'baiting, ground shooting and sitting ducks as the unsporting work of slaves and poor whites'. This aspect is germane in the context of the later nineteenth-century colonial India, because such ideas too were prevalent among British huntswomen—for example, in Savory's articulation of sportswomanship. While being critical of native shikaris' shooting for subsistence, she never spoke a word against fellow British hunters bringing down large game for sport and commercial profit. Such a dichotomy between coloniser and colonised demonstrates the political gradation of British enterprise at stake in the big game hunting world. In contrast to the subjugation of women in North America by the male white settler community, the huntswomen in the British Raj offers an example of female participation in dangerous pursuits. These women in India, unlike their North American counterparts, also began to endorse the colonial ideology of dominance over the native other in their hunting discourse. While slavery was a part of white masculine hunting culture in antebellum-era North America, provisional service characterised the beaters and coolies in colonial India. The helpers in India assisted the British sahib and memsahib when they were paid well, but retained their relative freedom soon after the completion of a hunt, in addition to liberty in their personal lives.

Nevertheless, huntswomen such as Blyth, Savory and others evidently disrupted the gender hierarchies in colonial India, as they began to articulate the notion of huntswomanship, insisting on the protection of wild species, especially of the non-predatory kind, for the continuation of the sport of hunting. Indeed, such elements of hunting should be considered in the light of ‘feminine ideals’, and this particular aspect of British women assuming imperial huntswomanship roles also reflects their dominance over native shikaris, and the hunting knowledge they had of the Indian marginal landscapes.

**A story of a tiger huntress: Lore of a different kind**

This final section examines another huntswoman in colonial India, W. W. Baillie, not only because her shikar exploits took place during the first two decades of the early twentieth century, but also since a different symbolism signified her hunts. Baillie's book *Days and Nights of Shikar* (1921) offers a narrative about a big game...
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huntswoman of a different kind, who had shot predatory animals such as tiger, panther and bison across the jungles of northern, western, central and southern India. Baillie's hunting technique consisted in sitting up on a machan (a timber platform on top of a tree) for many nights and eventually shooting a tiger:

I wasted many more good nights, that I might have spent better in sleep, in vain attempts. I did manage to shoot one tiger in a beat. He came slowly, creeping on, dragging himself along the ground and trying to look as if he were not there. I was up in a machan and, as I put up my rifle and shifted my position, a branch of the tree caught my big pith helmet and knocked it off my head. It went rattling down with a clatter among the dry leaves. The tiger stopped and looked and then glanced up and saw me. His stopping gave me a good chance of a shot. He rolled over, got up, and only went a few yards further, when he died.

Much like other British huntswomen, Baillie went out with parties ‘tiger-beating, under really favourable circumstances, the beat sometimes arranged by an Indian prince, sometimes by a sahib’ in places where tigers were most likely to be found. However, her real woman-shikari experience came to the fore when she began to go out hunting on her own; her first individual hunting experience was realised in shooting a panther. Subsequently, Baillie befriended wild Bhil tribes in the forest region of Gujarat, shooting ‘troublesome’ panthers with their assistance.

Virtually unaided by any British male counterpart, Baillie’s hunting practices also exemplify the realistic picture of the adversity faced by the typical big game hunting community, and on the question of stoicism and philosophical lament—aspects that were not widely discussed in nineteenth-century colonial hunting accounts, or in the later period. Perhaps male hunters did not feel troubled by such hardships in the hyper-masculine military world of the British Raj. For example, when hunting in the Himalayan region of Chamba (located in the Indian state of Himachal Pradesh), Baillie described the situation of her hunting party, including the native servants, thus:

It rained for 94 hours without a break. The shikaris and coolies had a miserable time. They tried to creep under the big rock where there was a little shelter, but water was streaming down the face of it and dripped on to them; they were drenched and cold and wretched … it was impossible to move; the streams were swollen, the water fall a roaring torrent, and the track we should have to follow impassable.

We waited until midday in hopes of finer weather, but the rain was as heavy as ever; so we made a start, walking on a very slippery ledge, over long rank grass and undergrowth, which made the falling soft and pleasant; and we all slipped and fell

103 W. W. Baillie, Days and Nights of Shikar (London: John Lane, 1921).
104 ibid., 2.
105 ibid., 1.
106 ibid., 1, 3.
107 ibid., 9–12.
many times. The falling was wet too, but, as we were soaked through in the first five minutes, that made very little difference. Crossing a stream, one of the coolies fell with his load on the brink of a precipice, but was just saved by the next man, who caught him and pulled him up. He cut his foot badly.\footnote{ibid., 34–5.}

The above information underlines the stoic experience of a British huntress in the face of an adverse hostile environment and testing topography. It also speaks about the relationship between Baillie’s native servants and spatial temporality, and her mastership of the hunt, which became regularised and formalised by the turn of the early twentieth century.

Baillie’s writing about the above-mentioned hunting episodes of tiger and panther hunts, embracing taxing hill-shikar adventures, found a growing domestic readership back in Britain, if not a majority readership (at least for the women’s hunting genre) in India. In dominating India’s royal beast and documenting her other exploits in a sequence of accounts of her hunting repertoire, Baillie was invoking a sense of a chivalrous huntswoman facade in the Raj. This facade was also based on the classic paradigm of bravery and exploration in the forest interiors of India and in the high altitudes of the Himalayas, with a twist of stoicism, and on her admiration of the intellectual adherence to the shikari movement and its governing codes.

In the Belgaum district of Karnataka State, Baillie claimed she had killed a tiger with one cartridge.\footnote{ibid., 50.} The carcass of the tiger was carried back to the camp and the nearby village, and the denouement of the hunting party was described in the following manner:

The coolies cut down poles, which they tied together, to carry the tiger back to [the] camp, and all these preparations took some time. As it was nearly dark [Baillie] rode back to camp and sent out a lantern. About ten o’clock [at night] the tiger was brought in on his stretcher by ten or twelve men amid great shouting and yelling, while the remainder carried flaming torches which they waved round him [the tiger]. A goat had to be given to the village to be sacrificed to Devi [the local goddess, on account of the successful completion of the hunting expedition].\footnote{ibid., 51.}

What we can see in the above report is Baillie’s huntswomanship aura, as found in the hunting expeditions undertaken by her male counterparts, but also disrupting gender and imperialism in the hyper-masculine world of the big game field in India, even feminising the forest field and rural countryside alike. In addition, the ‘camp’ and the ‘village’ were carefully orchestrated as public arenas that provided the raison d’être to show off her tiger-hunting prowess as an excellent shot in the presence of the village populace, while acknowledging their rituals in a token manner. Incorporating local rituals after a successful hunt was crucial to making authority
and broadcasting a worthy deed to the public. Baillie repeated a similar sort of tiger-hunting episode in the Central Provinces amidst much joyous celebration from the onlooking villagers, the women in particular.112

Drawing on Thompsell’s work, one can argue that such an active involvement of British huntswomen in the ecological peripheries of the empire confirms the extension of colonial control over the ‘interior’. This study begs the reader to reconsider the leading notion of ‘the image of the interior as an untamed frontier wherein British men could prove their mettle’.113 It further reinforces the notion of the ‘interior’ as a distinctive and essentially primitive place, helping to ‘preserve it as a space of regeneration for white masculinity’.114 The case studies of Baillie and others demonstrate that there were notable huntswomen in colonial India who reinforced the idea of ‘imperial femininity’ through their tiger shooting and other shikar accomplishments. These women shaped an alternative spatial temporality in the interior by taming the environment and its topography (hitherto considered the exclusive domain of British huntsmen).

Writing on the embodied historical geographies of hunting and colonial natural history, and the unsettling aspect of spatial and temporal territorialisation in colonial and post-colonial historical geographies, Jamie Lorimer and Sarah Whatmore argued that hunting involved ‘an embodied performance with a diverse array of audiences’.115 They refer to John MacKenzie’s assertion that the colonial hunt constituted a classic model for the culture of British imperialism. Hunting was not only a marker of civilisation, but also encompassed an ethos and characteristics that colonisers were expected to uphold in different territories and environments of the empire.116 Like sport and sportsmen, it was believed in the colonial world that hunting and hunters required they ‘be respected and admired by subordinate social classes (and races)’.117 This belief was paraded in a meticulous performance in Baillie’s hunting experience, as outlined above, honouring the local religious traditions and rituals with her mai-baap (paternalistic) demonstration, by concluding the tiger hunt in her chosen style. If we pay close attention to how this practice was received by the local onlookers, to whom it was directed in Baillie’s case, it was figuratively fulfilled. Lorimer and Whatmore describe such hunts as the performance of civilisation and refinement of colonial power.118

112 ibid., 142–4.
113 Thompsell, Hunting Africa.
114 ibid.
116 ibid.
117 ibid.
118 ibid., 681.
The colonial huntswoman Savory as an embodiment of independent feminist hunting culture is relevant in this context. Likewise, Barbara T. Gates aptly points out that Savory intended her hunting memoir to encourage women to participate and experience the thrill of big game hunting.\textsuperscript{119} Savory believed that ‘it is [the] highlands of India which are specially connected in the mind with tigers and tiger shooting’.\textsuperscript{120} She called for nascent women adherents to embark on the journey of big cat hunting and face the dangers involved in such adventures. Overcoming the adversity of the tropical climate is recommended for the huntswomen embarking on adventures in India.\textsuperscript{121} In order to achieve this acclimatisation, Savory advised that women needed to be physically strong to spend around eight weeks for a tiger shoot in the jungle, ‘and a high price has to be paid because it is worth it’.\textsuperscript{122}Unlike Savory, who shot tigers along with fellow European sportsmen as part of a hunting group, the case study of Baillie attempted to show that many of her big game exploits took place virtually unaccompanied by any British male counterpart. Thus her shikar expeditions did not involve their presence. Hence, Baillie’s tiger hunting successes with the local people in the Central Provinces and her panther shoots among the Bhil tribal community in the Gujarat illuminate the inimitable nature of her distinctive huntswoman persona. In that sense, Baillie’s image and her hunting genre differ from Blyth’s and Savory’s. However, it also extends her role as the defender of British imperialism by symbolising the image of shikar and the Raj. The tiger carcass after each of her hunts was purportedly carried out to the camp and village, and then carefully publicised as evidence of her dexterity as a huntswoman to the assembled crowd of villagers. Such an image invokes the metaphor of ‘the huntress and the tiger’ as a motivating force in confirming British imperial credibility to the rural populace.

One of Baillie’s huntswomanship skills that would distinguish her from her female counterparts was that she herself used to undertake the task of the measurement of the skins of wild animals she had shot.\textsuperscript{123} She also later commissioned an Indian (Hindu) taxidermist in the Bombay Presidency ‘for setting up heads’, for ‘curing and dressing skins’, and for having ‘animals mounted and set-up, with whole body’ using the carcasses of tiger, lion and panther, as well as other wild animals.\textsuperscript{124} All these related aspects elucidate the sophisticated nature of Baillie’s huntswomanship enterprise, positioning her big game exploits in the realm of ‘elite sport’.

\textsuperscript{120} ibid.
\textsuperscript{121} ibid.
\textsuperscript{122} ibid.
\textsuperscript{123} Baillie, \textit{Days and Nights of Shikar}, 57.
\textsuperscript{124} ibid., 57–9.
Baillie’s sporting ethos is significant for her time, in that she candidly admitted many instances of her failures in the hunting field, which reveals her genuine appreciation for big game pursuits in general. According to her, without such hunting quests, she could not have imagined any fulfilment in her life. In chapter XV of her work, entitled ‘Failures’, she writes:

I went again a year or two later to shoot in the Central Provinces, or to try to shoot I should say, as everything I did went wrong and there was nothing but disappointments and disasters, though I saw some tigers; in fact, things went so badly for me that I wrote some sad verses on grief and disaster which I set to (banjo) music, in a very minor key and sang Adagio, molto lamentoso, con-all-the-expression-I-could-put-into-it when feeling at my lowest.125

In a way, successes and failures in the forest field typified the relatively privileged huntswomanship careers of Blyth and Baillie, which point to the emergence of a different big game hunting genre and its practices, beyond the male-dominant worldview of hunting. As the historian Czech points out, in 1914 Baillie was given the singular honour of being the ‘only woman’ represented among the dozens of big game personalities featured in the folio-sized publication British Sports and Sportsmen: Big Game Hunting and Angling.126 After returning to London at the age of 65, she wrote and published her book Days and Nights of Shikar in 1921.127

Finally, it is worth noting that there were other British women who played noteworthy roles behind the scenes that shaped the culture of hunting as ‘sport’. For example, a Mrs Leech in the Ootacamund Hunt in the Nilgiris was appointed as a woman kennel superintendent in 1909. The Ootacamund Hunt claimed that theirs was the only sporting club that boasted ‘a woman kennel superintendent’ at the dawn of early twentieth century in south-western India. Leech was described as exemplary in the performance of her duties:

a more devoted and careful official could not be found anywhere. Having served under such undoubtedly good huntsmen as Captain Heseltine, Palmer, and Meyrick, she has acquired a great knowledge of hounds, and in all cases of sickness or accidents she nurses with unfailing devotion.128

Hence, it was not only big game huntswomen such as Blyth, Savory and Baillie but also other British women playing subsidiary roles in colonial India that warrant historical consideration. Women such as Leech were successful in the preparation of English and native foxhounds for chasing wild animals for the Ootacamund Hunt.

125 ibid., 221.
126 Czech, With Rifle & Petticoat, 56.
127 ibid.
in the Nilgiri Hills of the Western Ghats in southern India. This ignored aspect of history illuminates the fact that a woman like Leech, if not others, was often at the forefront of hunting clubs in discharging their duties of hound management.

The historical instances of huntswomanship found in the examples of Blyth, Savory and Baillie demonstrate the argument that the symbolic alignment of big game hunting, imperial masculinity and colonial domination was in reality neither predictably all-male nor exclusively monopolistic. Instead, gender and imperialism in relation to environmental history examined in this article would suggest how forms of colonial access, redefining the interior and the subtext of hunting narratives were successfully navigated by British women in different situations. It underlines their lived realities and the feminine articulation of big game hunting practices, thus necessitating a different understanding of the political, social and cultural dynamics of gender and empire. Precious McKenzie observes that even though British women were not allowed to hold positions in the colonial administration, ‘women who hunted earned a unique role themselves in the Empire … Sports for women flourished in India because British women did not usually participate in philanthropy and democratic political activism’, but they shaped the political dynamics of the Raj through outdoor sports such as hunting.\textsuperscript{129}

**Conclusion**

To conclude, this study has explored an important arena in the colonial history of hunting, and took as its subject matter the exclusive domain of male imperial hunters. A critical analysis of the history of huntswomen offers instances of women undertaking the ‘unfeminine pursuits’ of riding, hunting and shooting while announcing their shikar experiences through their writings and letters, which illuminate the history of the emergence of huntswoman culture in the nineteenth and early twentieth centuries in India. While British huntswomen were undoubtedly very few in number, importantly, the present article has shown that, in their role as sportswomen, Mrs Alan Gardner (Beatrice Blyth), Isabel Savory and Mrs W. W. Baillie were able to surpass the limits of their female and male counterparts in Victorian and Edwardian Britain. By virtue of the imperial race prerogative and having affluent backgrounds, these women created the codes of huntswomanship and the governing relations in relation to shikar and the Raj. In addition, they also outfoxed their male hunting assistants, exploiting their knowledge of topography and the whereabouts of the haunts and habitats of the forest fauna, and arrogating such indigenous information systems to their women’s hunting lore. In this way, they established their credibility as imperial women carrying rifles and dispatching even fearsome animals such as tigers, leopards and wild boars. Based on such unusual

\textsuperscript{129} McKenzie, *The Right Sort of Woman*, 87.
shikar feats, the British huntswomen successfully disrupted gender hierarchies both in relation to their British and Indian male counterparts, prompting the historical memory that they too played a distinctive role as ‘huntswomen’ on the fringes of empire, as well as taming the interior and their forest adversaries (i.e. wild beasts).

The analysis presented in this article sheds light on the importance of examining the forms of hunts practised by British women in the later Raj. Our study has elucidated how hunting operated under the umbrella of imperialism in colonial India and accentuated its practice as an ideal and sacred satisfaction in overcoming the dominance of the natural world. Such big game ventures were not available for women in Victorian and Edwardian Britain. The women’s hunting discourse also demonstrates how hinterland ecologies were consciously incorporated into dominant modes of animal categories and hunting rituals. British huntswomen created their notions of fair play and codes governing hunting practices by diminishing the agency of native hunters and other local groups. The animals’ agency was crucial to the ability to make statements about the category of hunted fauna and the perilous nature of historical geography in colonial India, on which British women based their claim to ‘huntswomanship’ credentials. In reinforcing such ideologies and practices that were at play, the British women were calculatedly making statements about themselves as members of the empire (imperial fabric), but with a twist of feminism and feministic ideals of the hunt.

Our discussion in this article illuminated such female hunters in India who contested the dominant male discourse; in particular, the fierce and reproachful lobby groups such as the men in Victorian Britain, the RGS and the RSGC, followed by the dominant British sporting press and their odious attitudes against women’s participation in hunts. This was a parallel development that occurred in Britain and in India. Taking a gun in hand, on their own or followed by native hunting assistants, arguably the British huntswomen successfully performed their role as the defenders of imperialism in the cultural and political ecology of India. As we have seen, Mrs Gardner (Nora Beatrice Blyth), Isabel Savory and Mrs W. W. Baillie reconfigured spatial temporality (for women) with reference to historical geography and the animal kingdom by situating their hunts in word and practice. Besides, the political rendezvous with Indian princes through shikar pursuits enabled them to reinforce gender distinctions in relation to imperialism. In doing so, the British huntswomen successfully contested the limitations of female participation (imposed by the male-dominant Victorian society) by partaking in big game pursuits in colonial India.

**Dedication**

I dedicate this article to my mother; it was under her parental resilience and nice food at home in Vizag that I was able to write this and the earlier article, and complete all the necessary revisions.
TEMPORALISING NATURE: CHRONOLOGIES OF COLONIAL SPECIES TRANSFER AND ECOLOGICAL CHANGE ACROSS THE INDIAN OCEAN IN THE AGE OF EMPIRE

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Abstract

The transfer of plants and animals across the Indian Ocean in the second half of the nineteenth and the early twentieth centuries transformed the environments of Australia, South Asia and Africa substantially. This article analyses the temporal dimension of these transfers. It examines the ways Europeans perceived time in the context of the transfers and investigates how timeframes were shifted to explain the ecological change caused by introduced species. This article argues that plants and animals brought their own temporal agency to the transoceanic transfers and examines the discrepancies between non-human life rhythms and human expectations. It highlights that the transfers often developed in ways Europeans could not predict. Furthermore, this article deals with the question of how to periodise the history of species transfer and ecological networking. By examining the timescapes of species transfer across the Indian Ocean, it aims to develop new perspectives on the problem of ecological imperialism.

Keywords: plant transfers, periodisation, Indian Ocean world, environmental history, non-human life

In the second half of the nineteenth and the early twentieth centuries, thousands of plants and animals were transferred between Australia, Asia and Africa. Cattle, horses and sheep were exchanged between the three continents. Australian trees were exported to Africa and Asia. Camels were brought from the Middle East to Australia. Birds from South Asia were taken to Australia and South Africa.²

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1 I am grateful to James Beattie for his comments and suggestions on the manuscript and to Brett M. Bennett for his constructive criticism on my research on ecological networks across the Indian Ocean in the last five years.

Landowners, foresters, botanists, merchants, politicians and other interest groups formed a broad coalition that keenly acclimatised plants and animals for economic, scientific and aesthetic reasons. In the age of empire, these species transfers reached unprecedented proportions and changed colonial environments substantially.

In recent years, environmental historians have devoted considerable attention to the transfer of biota and ecological knowledge across the Indian Ocean. Most of their studies, however, focus on spatial aspects and deal with the ecological, economic and social impact of these transfers. Although they have grown increasingly interested in temporal aspects and in space–time relations, the most influential texts about the temporal dimension of ecological change remain on a general level. They examine broad issues, such as, for example, the question of how to relate human-centred time with geological time when dealing with the Anthropocene, or how climate change influences the human awareness of time. The more specific problem of how to structure the history of transoceanic ecological transfer chronologically has been neglected so far.

This article aims to contribute to filling this gap. It has a relatively narrow time frame and does not offer philosophical reflections about the Anthropocene. It concentrates instead on the temporal dimension of species transfers across the Indian Ocean in the second half of the nineteenth and early twentieth centuries. Most historians agree that this was an age of globalisation and modernisation. Contemporaries witnessed processes of acceleration in many areas of their lives, and international politics aimed to standardise the measurement of time on a global level. It was a time when

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the transoceanic transfer of species increased. Notions of global condensation and connectivity played an important role in the European initiatives to transfer plants and animals across the Indian Ocean.

These initiatives were part of a global acclimatisation movement that had a strong basis in Australia but also found much support in South Africa and colonial Asia. Participants from different social and ethnic backgrounds took an interest in the transcontinental exchange of plant and animal species. Botanical gardens, acclimatisation societies, agricultural and horticultural societies, forest departments and colonial governments provided the institutional infrastructures for regular transoceanic transfer.

In the second half of the nineteenth century, botanists and foresters in the colonial services in Australia, South Asia and Africa were the most influential protagonists of these transfer processes across the Indian Ocean. Unlike the large numbers of amateur enthusiasts who participated in the acclimatisation movement, they had studied botany and other scientific disciplines at European universities. As a consequence of nineteenth-century professionalisation and specialisation, ‘naturalists’ and ‘gentleman scholars’ were increasingly replaced by experts for specific disciplines such as botany, forestry, zoology and, at the beginning of the twentieth century, ecology. In the colonies surrounding the Indian Ocean, these university-trained scientists explored the flora and fauna of Australia, Asia and Africa, contributed to discussions about the evolution of species and dealt with theories of acclimatisation. They exchanged information about the results of their research in correspondence and publications, and they sent each other plants and animals, dead and alive. They conducted much of their communication via the botanical gardens and other institutions of science in London, but in the second half of the nineteenth century they also corresponded directly across the Indian Ocean.

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7 Bennett, ‘A Global History of Species’.
Some of these scientists had German origins, such as, for example, Ferdinand von Mueller, the government botanist of Victoria and director of the botanic gardens in Melbourne, Dietrich Brandis, the inspector-general and a founding member of the Indian Forest Service, and Richard Schomburgk, the director of the botanic gardens in Adelaide and member of the Forest Board of South Australia. Their views on European imperial expansion were ambivalent. As members of the British colonial service, they explored the natural resources of the non-European world and provided the knowledge that facilitated British imperial rule. Together with British-born foresters and garden directors in South Asia, Australia and Africa, they also criticised the environmental destruction caused by settler imperialism. At the same time, however, they cultivated ties to their German homelands, communicated with their German peers and took an interest in German colonial initiatives and in the ecological policies in the German colonies after 1884–85.

The article focuses on this transnational group of German and British scientists who communicated their research on the natural world of Asia, Africa and Australia, exchanged plants and animals and were involved in processes of ecological change in the Indian Ocean region in the second half of the nineteenth and early twentieth centuries. The analysis of concepts of time and temporalities in the context of species transfers across the Indian Ocean is based on the sources these foresters and botanists produced: on their correspondence, their publications, the records of the botanical gardens and forest services, the minutes of forest conferences and meetings of acclimatisation societies, and other texts that deal with the species transfers across the Indian Ocean initiated by this group of scientists.

Narratives of acceleration, condensation and progress played an important role in the texts of these scientists. This article, however, aims to demonstrate that the concepts of time that shaped the species transfers across the Indian Ocean were much more complex than the narrative of globalisation allows. It shows that the transfers were characterised by different forms of temporality, and it deals with this problem from several perspectives. It examines chronological structures and situates key trends and


Temporalising nature

developments on a definite set of timescales. It relates continuities in the transfers to temporal categories that identify discontinuities and breaks. Since the main protagonists of the species transfers across the Indian Ocean were also the pioneers of the Indian Forest Service and, at the same time, keen reporters of environmental destruction, the article will, furthermore, discuss the issue in how far ‘modern’ environmentalism had its origins in the making of colonial forestry and species transfers in the Indian Ocean region. However, this article not only examines the chronological structures of species transfers, it also investigates perceptions of time. Emotions about the way time passes, about acceleration and progress, about the speed of biological growth and about the life cycles of introduced species, than the narrative of globalisation allows. The transfers were characterised by different forms of temporality, and the article deals with this problem from several perspectives.

To examine how the life rhythms of plants and animals shaped the species transfers across the Indian Ocean, this article applies concepts of non-human agency from multispecies ethnography and Actor–Network Theory. It emphasises that animals and plants brought their own temporal dynamics to transoceanic transfers, and it analyses how the European scientists who initiated the transfers dealt with the temporal agency of plants and animals. It asks how these scientists reacted when the outcome of the transfers did not coincide with their expectations because introduced plants and animals developed in unintended ways. Examining different temporal dimensions such as chronology, perceptions of time and the temporal agency of non-humans contributes to a better understanding of the history of species transfer and ecological change in colonial contexts.

Chronotopes of ecological imperialism

Europeans created specific space–time relations, chronotopes, when they contextualised their own species transfers across the Indian Ocean with the transfers initiated by Africans, Asians and Indigenous Australians. These other, non-European transfers had a long tradition. Long before European colonisation began, the ‘monsoon exchange’ brought African plants and animals to Asia and introduced Asian species to Africa. Following Fernand Braudel’s classic study on

13 See, for example, Grove, Green Imperialism; Barton, Empire Forestry; Rajan, Modernizing Nature.
15 Michail M. Bachtin, Chronotopos (Frankfurt: Suhrkamp, 2008).
the Mediterranean, Michael Pearson has argued that the monsoon brought ‘deep structure’ to Indian Ocean history. It regulated transoceanic exchange and created continuity and repetition over a long period of time.\textsuperscript{17}

In the second half of the nineteenth and the early twentieth centuries, Africans, Asians and Indigenous Australians continued to engage in species transfers independent of European interactions. At the same time, non-Europeans participated in the species transfers initiated by European colonists. In the early 1860s, for example, Raja Rajendra Mullick, an influential merchant in Kolkata, corresponded and exchanged species with the Acclimatisation Society in Melbourne.\textsuperscript{18} Non-Europeans also provided ecological knowledge as local intermediaries and as botanical experts who travelled between colonial gardens and research stations such as Buitenzorg (Bogor) in Java and Amani in German East Africa (Tanzania). The camels introduced to Melbourne from Karachi were accompanied by Muslim cameleers who supervised the camels during the voyage. In short, European scientists relied on non-European ecological knowledge in many ways, both on the local and on the transcontinental level.\textsuperscript{19}

In spite of such dependency, European scientists conceptualised their transfers as part of European time regimes, which gained in significance in the Indian Ocean region in the second half of the nineteenth century.\textsuperscript{20} They used European calendars to coordinate the transoceanic shipping of plants and animals, and they perceived themselves as pioneers of Western progress. Scientists often referred to the introduction of the telegraph and steamship, which made communication faster and diminished the time it took to travel across the ocean. In 1864, for example, the members of the Acclimatisation Society in Melbourne celebrated the new steamship line between Melbourne and Kolkata as a milestone on the path of progress. It reduced the duration of the voyage to about one month. This meant

\textsuperscript{17} Michael Pearson, \textit{The Indian Ocean} (London and New York: Routledge, 2003), 13–26, doi.org/10.4324/9780203414132.
that some plant and animal species could now be transported alive.21 Another cause for enthusiasm among the acclimatisation societies and botanical gardens of the Indian Ocean region was the building of the Suez Canal, which seemed to offer new possibilities for transporting species to Europe with greater speed.22

Applying a teleology that was typical for European colonialism, scientists often placed themselves in the present and shifted non-Europeans back into the past in various ways. They presented themselves as well-connected, technologically advanced experts, whereas non-European forms of ecological knowledge, species transfer and ways to integrate introduced species in indigenous agricultural systems were condemned as primitive and locally confined. They were moved backwards to a distant past, usually to an early stage of human development.23

While creating a temporal distance from non-European species transfers, the scientists emphasised that their own activities rested on the research of their European predecessors. They developed scientific reference systems that referred to their previous achievements. Often, they named species new to them after their mentors and other father figures, and highlighted their merits in various forms of memorial literature.24 In this way, they created generational patterns that structured species transfers and research about ecological change on the timeline. The scientists perceived themselves to be at the top of a dynasty of European explorers who were involved in the species transfers across the Indian Ocean and who were building on each other's work.

Referring to the teleologies of ecological imperialism was, however, only one way of creating chronotopes of species transfer across the Indian Ocean. European scientists established other temporal parameters, which complicate the idea that they completely identified with the time regimes of imperial rule. Although they often ignored non-European transfers that took place simultaneously with their own transfers, they sometimes highlighted long-term continuities of species transfers in the Indian Ocean world and, in this way, defined timelines that diverged from the racial hierarchies of European imperialism.

23 To give just one of many examples, Mueller pointed out that the ‘autochthonous Australians’ remained in the ‘cruel depths of human culture’ in a letter to Rudolph Virchow, 26 October 1887: R. W. Home et al., eds, Regardfully Yours: Selected Correspondence of Ferdinand von Mueller, vol. 3: 1876–1896 (Bern: Peter Lang, 2006), 480.
24 See, for example, Joseph Maiden, Sir Joseph Banks: The ‘Father of Australia’ (Sydney: W. A. Gulick; London: Kegan Paul, 1909), doi.org/10.5962/bhl.title.115949.
European scientists constructed deep times when they placed their own transfers in the tradition of precolonial African–Asian exchanges. In his *Forest Flora of North-West and Central India* of 1874, Brandis, for example, pointed out that the vegetation of these regions was characterised by introduced species. Some of them, he argued, were brought to Northern and Central India more recently, whereas others had been introduced in ancient times and had existed in the region since ‘time immemorial’. On his tours, Brandis observed plants from other parts of India, Burma, Ceylon and Western Asia. He noticed a ‘large number of African and Arabian species’, he identified American trees and shrubs, and he referred to eucalypts, albizias and acacias from Australia. He discussed the existence of what he identified as ancient practices of planting, cutting and using trees before and during colonial times. He not only dealt with the regions that had introduced the trees but also included descriptions of how they were cultivated in their countries of origin. In this way, he defined a global context that reached beyond the colonial frame in space and time.

By referring to the antiquity of introduced trees, the scientists, furthermore, established chronotopes that legitimised their own transfers across the Indian Ocean. In 1884, in a publication on the acclimatisation of extratropical plants in Australia, Mueller quoted Brandis, who had stated that the Nepal Cypress in northern India would attain an ‘age of 1,000 years’. Mueller created transoceanic coherence by relating the Australian colony of Victoria with northern India as extratropical regions. He assumed that trees that were extremely durable in the one region could, once introduced, reach equal permanence in the other.

Foresters often used the temporal category of ‘time immemorial’ when they referred to trees of a very old age. Colonial historians argue that ‘time immemorial’ was a deliberately vague and inaccurate term, describing a very long time without specification. They claim that it was used to stereotype the history of non-European societies as timeless, primitive and pre-modern, whereas the colonial era was associated with modernity and the precise measurement of time by Western calendars. From their point of view, the category ‘time immemorial’ created two separate time spheres, precolonial indigenous versus colonial.

For the species transfers across the Indian Ocean, this is true in many respects. European scientists indeed referred to non-European ecological customs such as fire cultivation as having been practised since ‘time immemorial’ in a generalising

and dismissive way. However, they also developed more differentiated perspectives when they used the phrase. The imperial forester David Hutchins, for example, acknowledged the usefulness of the ancient practice of fire cultivation or pointed to Indigenous Australian burning of woods in order to criticise the destruction of nature by settler imperialism: the forest ‘has been ravished by the fires of the blacks from time immemorial and recently by the more severe fires of the whites’.29

Creating deep time by describing ancient practices of forestry and by highlighting the mythical age of trees stood in sharp contrast to the fact that nineteenth-century scientific forestry cultivated the discipline of dendrochronology to precisely measure the age of trees. Referring to ‘time immemorial’ served different purposes and had ambiguous meanings with respect to the time regimes of European imperialism. The foresters created chronotopes that bridged the chronological caesura between precolonial and colonial rather than dividing between two time spheres. Trees which were introduced a very long time ago were described as symbols of eternity. Religious connotations played an important role with respect to European and to non-European forests. Mueller, for example, when he argued in a lecture in 1871 that ancient trees and forests should be preserved, explained that the ‘silent grandeur of a dense forest, before the destructive hand of man defaced it[,] conveys to our mind a feeling as if we were brought more closely before Divine Power’.30

In the political arena, such references to the antiquity of trees and forests could be used to underline demands for state intervention to protect tropical forests in British India and the colonies in Australia and Africa. Whereas in Europe the reforestation of areas where trees had been cut was regarded as part of the planning routine of forest administrations, many scientists were convinced that the ancient tropical forests in the Indian Ocean region could not regenerate themselves. For example, in an 1895 handbook on timber in East Africa that was edited by Adolf Engler, the African traveller and director of the botanical gardens in Berlin, it was argued that, once destroyed, tropical forests were gone forever and could never be grown again in their original state.31 References to deep time thus had different and sometimes ambivalent functions in the discourses that contextualised species transfers in imperial settings.

28 David E. Hutchins, A Discussion of Australian Forestry: With Special Reference to Forestry in Western Australia (Perth: Fred. Wm Simpson, 1916), 42.
29 Hutchins, A Discussion of Australian Forestry, 175.
Biochronologies

The self-fashioning of European scientists as modernisers, who implemented faster means of transportation and Western ways to measure time, needs to be questioned in the context of species transfers across the Indian Ocean. Although the decades before the First World War witnessed powerful international initiatives to standardise the measurement of time, there still was a large variety of different temporalities that shaped the transfers in the Indian Ocean region. Many societies and cultures around the Indian Ocean used their own calendars, be they Hindu, Muslim or those of other backgrounds. The Arab and Malay trade based on dhow and prahu boats continued in the so-called ‘age of the steamship’.

Species transfers crossed various time zones and moved between tropical, moderate and dry climates. Shipping calendars were influenced by the monsoon, both in precolonial and colonial times. Different agricultural systems had different planting and harvesting cycles. It was a matter of complex calculation to decide the best time for sending plants and animals across the ocean. For the transport of living plants in Wardian cases from South Africa to Kolkata, for example, the end of the South African winter in the middle of August was considered to be most suitable as departure time from South Africa. The plants would then arrive in Kolkata at the beginning of the Bengal winter, which seemed to be the most favourable season for the cultivation of introduced plants from South Africa. Species exchange between Melbourne and Kolkata required the same complicated timing. However, corresponding about ideal timetables did not mean that the plants and animals could actually be sent off at times that would have been perfect for the acclimatisation of newly arrived species. When, for example, the Agricultural and Horticultural Society of India received seed potatoes from Melbourne in 1880, they were reported to be ‘in excellent sprouting condition’, but they had ‘arrived too early in the season for Bengal’ and had to be ‘distributed to residents at Darjeeling and other hill stations’.

35 Seed potatoes from Melbourne, Monthly Proceedings of the Society, Thursday, the 22nd July, 1880, xix, *AgriHorticultural Society of India, Library, Kolkata.*
Furthermore, the transfers across the Indian Ocean were determined by the life cycles of the participating plants and animals. Their biological rhythms rarely coincided with the demands of the transfer processes. During the transoceanic passage, animals often received inadequate food and water. Plants were not properly cared for by crews. The risk that plants and animals that were shipped off alive might die during the voyage was considerable. Animals that survived the passage often became sick and died in their new environment. Plant samples and seeds grew too slowly, too fast or not at all, and could not be used for farming.36

The speed with which introduced species naturalised was a key topic in the discourses that accompanied the transfers. Different interest groups had diverging visions about the ideal speed with which introduced species should grow and multiply. Scientists often highlighted the slowness of adaption when they reported progress to colonial audiences that demanded quick results and an immediate promise of economic success. Acclimatisation, the scientists argued, was a ‘very slow and delicate process, and much time must obviously be expended before very decided results can be expected’.37

Scientists had different motives in emphasising the longue durée of the adaption process of introduced species. First of all, they had to justify why the expensive transfers showed no immediate results. At the same time, however, references to the slowness of adaption were influenced by nineteenth-century discussions about the evolution of species as a long-term process of continuous micro-changes.38 The scientists who transferred plants and animals across the Indian Ocean were important participants in these debates. When they emphasised the long-term continuities of ecological change, they not only reacted to the temporal dynamics of the introduced species and to the economic expectations of their colonial audiences, they also contributed to ongoing research about the evolution and global distribution of species.

The problem of the slowness of growth rates was particularly central to the discourse about the transfer of Australian trees to Asia and Africa and the subsequent reforestation of areas that had suffered from the cutting of woods and desiccation. High-ranking foresters and botanists in Australia, India and South Africa, such as, for example, R. S. Troup, a member of the Indian Forest Service, highlighted that ‘the recovery of the forests from the effects of the drought must of necessity

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36 See, for example, Ferdinand von Mueller to the Committee of Management of the Zoological Gardens, Report on the Aviary, 3 February 1859, in Regardfully Yours, ed. Home, 3:441.
37 The Third Annual Report of the Acclimatisation Society of Victoria, 30; for a discussion of different acclimatisation theories in the French and British context, see Osborne, ‘Acclimatizing the World’, 136–40; for the reception of acclimatisation theories in Australia, see Pete Minard, All Things Harmless, Useful, and Ornamental, 23–42.
38 Penelope Corfield, Time and the Shape of History (New Haven, CT, and London: Yale University Press, 2007), 60, 61.
be slow.' Other prominent foresters and botanists emphasised the discrepancies between the long-term continuities of forest growth and the hectic nervousness of human expectations. ‘The subject of forest management is a long and broad one’, John Ednie Brown, the Conservator of Forests for South Australia, argued in 1881. It would require ‘a considerable number of years to test the results of any experiments that may be made in it’. Brown’s successor, Walter Gill, complained in 1893 that the settlers’ short-sighted economic greed would result in:

the suicidal policy of cutting timber too young to secure immediate profits, instead of waiting a proper time for fuller returns from larger timber—a practice often followed as a result of external pressure by those who clamor for prompt returns.

Joseph Maiden, the director of the botanic gardens in Sydney, dedicated a section of his 1903 study on sand drift in New South Wales to ‘the element of time’. He emphasised that the reforestation of sand dunes took many decades and criticised ‘some people [who] think plantations may be formed in pure sand and produce merchantable timber in a space of time that experts know to be out of the question’. Against the background of general criticism of the slowness of reforestation, forest officials and garden directors praised the Australian eucalypts and acacias for growing extremely quickly. They advocated transfers of Australian species to Africa and Asia by claiming that ‘the rapidity of growth of the blue gum exceeds that of any tree indigenous … and has been the admiration of all forest officers’. In this way, the scientists defined several layers of time that worked at different rates of temporal change. The short-term pace of human planning and the expectation of quick economic returns occurred simultaneously with the longer-lasting life cycles of introduced trees. Different temporalities proceeded simultaneously. These temporal discrepancies played an important role in the transfers across the Indian Ocean.

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Scientists often applied generational patterns to structure the longue durée of reforestation and to explain why colonial time regimes and biological growth were not in sync. When Brandis opened the Forest Conference in Simla in 1875, he remarked:

our difficulty is that the result of our work does not show at once, and the mistakes we make in the organisation and the treatment of our forests do not, as a rule, manifest themselves until a generation of foresters has passed away, and the work has gone into the hands of new men who had nothing to do with the framing of the original measures. When a railway is built or a canal made it is not generally long before the main defects of plan and construction manifest themselves; but the effect of a wrong treatment of a forest may not show itself for a long series of years.45

Brandis highlighted the diachronic dimensions of forest management by introducing generational layers. Whereas the chronologies of human-made infrastructures coincided with human lifespans, the biochronologies and life rhythms of plants could only be explained by taking a much longer perspective. Contemporaries could not judge the success or failure of reforestation in their own lifetimes but had to leave it to future generations.

When Richard Schomburgk gave a lecture at the Chamber of Commerce in Adelaide in 1878, he made the same point by referring to Greek antiquity:

Ulysses, after a ten years' absence from Troy … found his aged father in the field planting trees. He asked him why, being now so far advanced in years, he put himself to the fatigue and labor of planting that he was never to enjoy the fruits of? The good old man, taking his son for a stranger, gently replied 'I plant for my son, Ulysses, when he comes home.'46

Schomburgk moved the time frame from the present to future generations to show that the temporal dynamics of reforestation diverged from human temporalities and life rhythms.

Colonial scientists appreciated the fast growth of introduced Australian trees because it seemed to synchronise human expectations with the rhythms of nature. However, high growth rates could turn into a problem when introduced plants and animals spread faster than expected. If introduced species had no natural enemies in their new environments, they sometimes began to spread rapidly. One of the best-known examples of an introduced species that multiplied so quickly that colonists felt threatened was the opuntia (‘prickly pear’). Originating in South America, the opuntia was introduced to South Africa, Australia and British India at the end of

the eighteenth century. At first, the plant was popular with the settlers. They used it in their gardens and for agricultural fencing. However, the opuntia soon started spreading on its own with the assistance of birds and other animals that carried its seeds over land and water. When from the middle of the nineteenth century the opuntia grew over riverbeds, valleys and farmlands, colonists perceived it as invasive weed and sought measures to eradicate it.47

At the Simla forest conference in 1875, the participants discussed the problem of the rapid growth of the opuntia. Some of the forest officials pointed out that its expansion had reached ‘unmanageable dimensions’ in some regions and that there was a feeling that the opuntia ‘has mastered and not served us’.48 The temporal agency of plants and animals resulted in discrepancies between biochronologies and human expectations that undermined the narrative of the scientists as powerful re-creators of colonial landscapes.

**Spaces of experience and horizons of expectation**

The scientists who moved species across the Indian Ocean were themselves often mobile. In the second half of the nineteenth century, many of them had come to the colonies from Europe. When they left their homes, they gave up old certainties about what the future would bring for them. Had they remained in their places of origin, their futures might have been predictable in certain respects. By emigrating, however, the future was no longer regarded as an extension of the present that could have been anticipated from past experiences. The scientists moved into the unknown. They expected the future to be different from what it might have been had they remained in Europe. They were open to new opportunities and excited about making new scientific discoveries. At the same time, however, they were aware of the risks a new beginning in an unknown social and natural environment would bring.49

As Europeans in the age of empire, colonial scientists had a clearly defined vision of how an ideal colonial landscape should look in the future. It was a vision shaped by the academic knowledge they had acquired at European universities and by the stereotypes of the civilising mission. The purpose of species transfers was to ‘improve’ colonial environments, to make them economically profitable and aesthetically

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49 For the anxieties Europeans developed when they encountered unknown landscapes and climates in Asia, Australia and New Zealand, see Beattie, *Empire and Environmental Anxiety*, pp. 4–38.
pleasant. The scientists wanted the species transfers to have an outcome that rose
to these expectations. If the plants and animals they introduced contributed to
an increase in the quality and quantity of agricultural products, the transfer was
regarded as a success. If it turned out that introduced species could not be used to
augment economic profit or to enhance the lifestyle of colonial elites, the transfer
was judged a failure.50

At the same time, however, scientists often pointed out that it was one of the
most important aspects of the transfers that their results could not be anticipated.
The concept of the ‘experiment’ was central to the history of colonial species transfer
across the Indian Ocean in the nineteenth century. To consider the transfer of plants
and animals as an experiment implied that the outcome was open. In the context of an
experiment, as, for example, the philosopher Elisabeth Pernkopf shows, knowledge
is not gained by following a straightforward line towards an envisioned goal. In an
experimental system, categories such as surprise, disappointment, repetition and the
unintended are important for acquiring insights that can be considered as ‘new’.51

The species transfers were characterised by tensions between an ambition to create
the ideal landscape for European settler colonialism and scientific claims that the
results of the transfers could not be predicted. When, for example, in the first
half of the nineteenth century, Australian and South African merino sheep were
introduced to Madras to improve the quality of locally grown wool, the official
records to document the outcome were entitled ‘Results of the experimental
measures adopted for the improvement of the breed of sheep from the merino
reported’.52 By emphasising the experimental nature of the transfers, the claim to
improve colonial agriculture was turned into a scientific hypothesis that had to be
tested. Arguing that this exercise was one of experimentation, the scientists justified
outcomes that could be perceived as failures if measured against the expectations of
improvement and economic profit.

The unpredictability of species transfer often caused difficulties for acclimatisers.
When introduced plants and animals behaved in unanticipated ways, scientists had
to cope with pressure from many different sides. The export of Australian eucalypts
and acacias, for example, was based on the belief that the qualities of these trees
would make them contributors to the civilising mission of improving upon nature.
They were praised for growing quickly in dry and hot climates, for bringing shadow
to the African deserts, for preventing malaria, and for other virtues that would bring
progress to Africa and Asia. Against this background, Mueller, one of the main

50 For the connections between acclimatisation and colonisation in Australia, see, most recently, Minard, All Things
Harmless, Useful, and Ornamental, 9–22.
51 Elisabeth Pernkopf, Unerwartetes Erwarten. Zur Rolle des Experimentierens in naturwissenschaftlicher Forschung
(Würzburg: Königshausen & Neumann, 2006).
52 Madras Presidency, ‘Purchase of Australian and South African Merino rams by the Madras Government’.
protagonists of the nineteenth-century export of Australian trees to other warm regions of the earth, found it somewhat embarrassing when the success story was questioned by recipients who complained that an insect, the *Icerya purchasi* (cottony cushion scale), travelled on the acacia and caused considerable damage to the citrus plantations of Ceylon, California and other regions where acacias were introduced.\(^53\)

Mueller defended himself against these accusations by referring to the experimental character of the transfers. He offered scientific explanations to his critics and promised to do more research to keep the ‘mischievous’\(^54\) insect under control. Furthermore, he exculpated himself by pointing out how difficult it was to locate the origins of the *Icerya purchasi*. He emphasised that the *Icerya* was first observed in Ceylon and Brazil and not in Victoria. ‘Whether the Icerya was originally an inhabitant of Victoria or merely immigrated, I will endeavour to ascertain’,\(^55\) he promised a critical enquirer. Mueller differentiated between two kinds of species. The eucalypts and acacias he exported had their origins in Australia. Their transfer was initiated by Mueller and, as government botanist of an Australian colony, he felt responsible for making their acclimatisation a success. Other species, by contrast, did not seem to have their roots in Australia, and their migratory patterns escaped human influence. For them he felt less willing to take the blame.

From a psychological perspective, his remarks about the doubtful origins of the *Icerya* were meant to explain why the expectations of the civilising mission could not be fulfilled. Species that were clearly identified and classified were perceived as ‘desirable animal colonists’\(^56\) and as partners in the imperial project. Species without classifiable origins that travelled beyond human control and then damaged the plantation economy earned themselves a different status. At the same time, Mueller’s interests in the origins and global distribution of species were part of the scientific debate about the evolution of species. Therefore, his promise to explore the origins of the *Icerya* can also be read as the professional reaction of a scientist who wanted to contribute to ongoing research in his field of study.

Searching for times and places of origin was important both for the self-fashioning of human migrants and for defining and classifying non-human migration. Organising the migration of plants and animals on a timeline was crucial for the scientists to be able to define their transfers as controllable at a time when they became increasingly


\(^55\) ibid.

aware that the species that they were introducing into new environments developed their own unmanageable dynamics and often did not improve but actually endangered existing ecological systems.

**The rhythms of ecological networking across the Indian Ocean**

The ecological networks that connected the botanical gardens, forest departments and acclimatisation societies of the Indian Ocean region changed over time. It has never been analysed, however, how exactly this process was taking place and how space–time relations within the networks across the Indian Ocean shifted in the age of empire. All we have are general assumptions that the hierarchies between the centre of imperial botany at the Royal Botanic Gardens, Kew, and the botanists in the colonies declined in significance in the course of the nineteenth century and that polycentric networks between the colonial gardens grew more important. It is therefore necessary to come to more accurate conclusions about how the networks across the Indian Ocean developed chronologically and how the scientists defined and redefined the space–time relations of the Indian Ocean transfer in the age of empire.

A potential approach to dealing with this problem is to look at the networks of important protagonists of the ecological transfers across the Indian Ocean. This would allow a detailed insight into how the geographic and scientific fields of interest changed within a clearly defined time frame. One of the most influential networkers in late nineteenth-century botany was undoubtedly Mueller. After his arrival in Australia in 1847, he developed a world-encompassing communication network that included contacts with colleagues all over the Indian Ocean world. Mueller had been interested in the floras of Asia and Africa since the beginnings of his academic career at the University of Kiel. Since the 1850s, he had been involved in transfers of species and other scientific exchanges with the botanical gardens in Singapore, Buitenzorg (Bogor), Mauritius, Peradeniya, Kolkata, Ootacamund and Cape Town, with the horticultural and agricultural societies in Natal and Kolkata,

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57 Most recently for the gardens in Singapore, Timothy Barnard, *Nature’s Colony: Empire, Nation and Environment in the Singapore Botanic Gardens* (Singapore: NUS Press, 2016), 8; for the complexities of this process of increasing direct intercolonial communication and transfer, the sending of duplicates and other problems, see, for example, James Sykes Gamble to W. Thishelton-Dyer, Simla, 16 May 1877; Dietrich Brandis to Thishelton-Dyer, Simla, June 1877. Miscellaneous Reports, Victoria (MR/412), Royal Botanic Gardens Kew, Archives; Dietrich Brandis to Joseph Hooker, Simla, 22 July 1877. Directors’ Correspondence DC/153/118, Royal Botanic Gardens Kew, Archives.

and with the officials of the Indian Forest Service and other colonial forest services. Moreover, as a leading member of the acclimatisation society of Melbourne, he engaged in species transfers with partners in South Africa and Asia.

Many of these exchanges were characterised by continuities. Mueller engaged in transfers with garden directors in the Indian Ocean world on a regular basis. As a seed collector for the government of Natal, he sent seeds of eucalypts to South Africa for over 40 years until his death in 1896. However, the steady regularity could change its pace under certain circumstances. There were moments of condensation, when contacts intensified, and of relaxation, when mutual interest was low and only few letters and plant samples were exchanged. The International Exhibition in Kolkata in 1883, for example, resulted in a general increase of transfers from Australia to Kolkata when government officials, among them Mueller, aimed to display the natural products of their colonies at the exhibition.

Furthermore, Mueller had a continuing interest in the vegetation of New Guinea. Since the mid-1860s, he advertised the potential of the island in correspondence with his colleagues. In 1865, he suggested to August Petermann, the influential cartographer in Gotha, that Germany should found a colony in New Guinea. In the 1870s, he urged Joseph Hooker that more should be done to explore the ‘treasures of the wonderland New Guinea’. However, his initiatives did not meet with much enthusiasm in either Gotha or Kew at that time. By the mid-1880s, by contrast, when German politics began to direct their attention to New Guinea and the region turned into a burning glass of Anglo-German imperial rivalry, Mueller was able to intensify his efforts to explore its flora and gained funding from Australian sources to organise a number of expeditions.

In the 1880s, Mueller also developed a keen interest in the tropical vegetation of the north of Australia. Important correspondents during these years included Maurice Holtze and his son. Maurice Holtze was the government gardener of the Palmerston Botanical Gardens from 1878 until 1891, and an experienced traveller in South East Asia. In 1891, his son Nicholas succeeded him as curator of what had become the Darwin Botanical Gardens. In his cooperation with the Holtzes, Mueller eagerly

60 See, for example, Ferdinand von Mueller to Thomas Wilson, 7 May 1883, in Regardfully Yours, ed. Home, 3:313, 314; for the colony of South Australia, see ‘Calcutta International Exhibition 1883, Copies of Letters sent by the Commissioners’. GRG44/64. State Records of South Australia, Adelaide.
62 Ferdinand von Mueller to Joseph Hooker, 1 December 1871. Correspondence of Ferdinand von Mueller Project. Royal Botanic Gardens Victoria, Library. I am grateful to Professor Roderick W. Home and to Dr Sarah Maroske for granting me access to the digitised collection of Ferdinand von Mueller’s letters in the library.
63 Regardfully Yours, ed. Home, 3:30–3.
accumulated knowledge about the tropical vegetation of northern Australia. Carried by a wave of enthusiasm, he identified, classified and named a large number of species they sent to him. For Mueller, collaborating with Maurice and Nicholas Holtze on the tropical flora in the north was a clearly marked era in his scientific work. He compiled long lists with species he advertised as ‘new’, or ‘neu’ when he corresponded with Maurice Holtze in German. Sometimes the words ‘new’/‘neu’ were underlined in his handwritten texts. In numerous publications for a variety of scientific and semi-scientific journals and newspapers he announced ‘new’, ‘hitherto unrecorded’ and ‘undescribed’ species to his readers.64

Building on his long-standing interests in the vegetation of South and South East Asia, Mueller began, in his correspondence with Maurice Holtze in the 1880s, to relate the ‘newly discovered’ plants of northern Australia with plants known in South Asia, New Guinea, Java and the Pacific islands in a more specific and precise way than before. He aimed to contribute to nineteenth-century research on global plant distribution and evolutionary biology by investigating whether certain species that could be found both in north Australia and in Asia originated from the same families.65

Mueller tried to explain how the species could have been transported across the water between northern Australia and the neighbouring Asian regions without European intervention. He occasionally referred to Malayans who were involved in species transfers between northern Australia and South East Asia. In doing so, he showed a vague knowledge of the contacts indigenous societies in this region had cultivated across the ocean for a long time.66 Another explanation Mueller offered was that ‘migratory birds’ transported seeds across the ocean and, therefore, were responsible for Asian–Australian species transfers and distribution.67 Again, he connected research on species transfer with questions of origin and tried to categorise species as native or introduced: ‘In 1855 & 1856 Oryza could not have reached the places where I saw it through Malayan advents. If migratory water birds brought it, then we have to regard it as indigenous, for that would apply to many places in South Asia as well.’68

64 ‘Descriptions of Plants and Correspondence of Dr. Maurice Holtze and Baron Ferdinand von Mueller’. GRG19/391. State Records of South Australia.
65 ibid.: see, for example, Mueller to Nicholas Holtze, 29 January 1893; see also Sara Maroske, ‘Australian and Indian Plants: Making Connexions in Nineteenth-Century Botany’, Historical Records of Australian Science 23, no. 2 (2012): 107–19, doi.org/10.1071/HR12013.
67 ‘Descriptions of Plants and Correspondence of Dr. Maurice Holtze and Baron Ferdinand von Mueller’, Mueller to Nicholas Holtze, not dated. GRG19/391. State Records of South Australia.
68 ‘Descriptions of Plants and Correspondence of Dr. Maurice Holtze and Baron Ferdinand von Mueller’, Mueller to Nicholas Holtze, 12 January 1892. GRG19/391. State Records of South Australia; the letter is published in Regardfully Yours, ed. Home, 3:592–3.
In his correspondence with the Holtzes in the 1880s and 1890s, Mueller created a transoceanic spatial unit that connected tropical North Australia with South and South East Asia. He defined this unit as ‘new’, as far as his own research was concerned, and emphasised that the question of how to classify the ‘newly discovered’ species was open to discussion.\(^69\)

The way in which the focal points in Mueller’s network shifted shows how ecological transfers across the Indian Ocean changed in the age of empire and how specific space–time constellations were created in the process of the transfers. To explore such transoceanic dynamics, which have been largely overlooked so far, it is necessary to focus on fine layers of time in limited long-distance time frames. These are just as significant to the explanation of ecological change as the long-term perspective of the Anthropocene.

The origins of ‘modern’ environmentalism

The question of origins and of what could be described as ‘new’ in the context of the global distribution of species and ecological knowledge was not only of interest to scientists in the nineteenth century. For some time now, environmental historians in different regions of the globe have dealt with the problem of where and when the roots of the ‘modern’ environmentalism of the twentieth century can be found. They have come to a variety of conclusions. European historians often argue that the origins of ‘modern’ environmentalism have to be located in the nineteenth-century European Enlightenment and romanticism, and were a reaction to industrialisation and urbanisation.\(^70\) Historians of the British empire associate a new quality of environmental protection with the making of the Indian Forest Service in the second half of the nineteenth century.\(^71\) A new study now locates the ‘roots of biodiversity science’ in the Caribbean in the first half of the twentieth century.\(^72\) Historians of early modern European overseas expansion highlight the continuing awareness of environmental destruction in colonial contexts dating from the early modern expansionism until the 1860s.\(^73\) Historians in different research contexts thus come to different conclusions about the time and place of the origins of environmentalism. They also seem to have different definitions of the term in its changing relations to economic and scientific interests.


\(^71\) Barton, Empire Forestry.


\(^73\) Grove, Green Imperialism.
This article aims to contribute to the rather disparate state of research by highlighting that the scientists who transferred species across the Indian Ocean played an important role in the making of global environmental discourses and practices. As participants in the species transfers across the Indian Ocean, they developed a specific awareness for environmental change and destruction. Their transoceanic communications were informed by a complex set of different ideas about nature and climate. Traditional European perceptions of nature and long-standing ideas and practices of forest conservation were intertwined with new experiences that the scientists made after having arrived in the Indian Ocean region. The scientists witnessed the destruction of nature on the local level, on their journeys, in their forest districts and when they participated in the acclimatisation of species.

The scientists who were involved in species transfers across the Indian Ocean often wrote about the environmental transformations they observed. The transfer of acacias and eucalypts, for example, took place in the context of wider-reaching controversial discussions about deforestation in the colonial forest services surrounding the Indian Ocean. Demands for state intervention to protect the natural environment in the colonies were part of these discussions. The scientists campaigned for forest administrations in the Australian and African colonies, legislation to protect forests and wildlife, and the creation of reservations to protect flora and fauna in specific regions.74

The discussions about deforestation, soil erosion, desiccation and climate warming had a strong emotional quality. James Beattie has demonstrated that environmental anxieties about the destruction of nature by settler imperialism, along with concerns about living in hot climates and tropical diseases, played an important role in the exchanges between South Asia and Australasia.75 In the correspondence of the scientists who transferred species across the Indian Ocean, we find such anxieties resulting from the personal experiences that were formed on the local level. These experiences and observations were intertwined with references to publications on climate change that were directed to a wider audience and appealed to such concerns. Some of the scientists who transferred species across the Indian Ocean were inspired by George P. Marsh, an influential American polymath. His book, *Man and Nature*, first published in 1864, argued that deforestation would result in a dramatic change of climate. His vision of the future was apocalyptic. He was

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74 See, to give just one example out of a large number of comparable publications, Ferdinand von Mueller, ‘Forest Culture in its Relations to Industrial Pursuits’, *Journal of Applied Science* 27 (1872).
75 Beattie, *Empire and Environmental Anxiety*. 
convinced that deforestation and climate change would eventually make the earth uninhabitable for mankind.\textsuperscript{76} Mueller referred to Marsh, and Brandis corresponded with him.\textsuperscript{77}

Awareness of environmental destruction in the context of species transfers across the Indian Ocean had its own specific momentum. Although it had European origins, it was based on different preconditions and on different sets of ecological knowledge than the environmentalism that developed in Europe in the nineteenth century. The question that follows this conclusion is how exactly the environmental awareness in the Indian Ocean region can be related to the environmentalism in Europe, and how its protagonists in both world regions influenced each other in the age of empire that is often described as a time of increasing global communication among experts.\textsuperscript{78}

Analysing the chronologies of exchange on the macro level contributes to answering this question. To define thin layers of time helps to build a chronological structure of the transfers circulating in the Indian Ocean region, and it provides us with a differentiated picture of the directions the transfers were taking between the Indian Ocean region and Europe. Organising the transfers chronologically can explain where environmentalist ideas originated, and it can shed new light on the causal connections that shaped the transfers across the Indian Ocean and between the Indian Ocean region and Europe.

Since some of the scientists who initiated the transfers across the Indian Ocean had German origins, one way of answering this question is by directing the focus to the circulations between the German scientists in the Indian Ocean region and their colleagues in Germany. In Germany, the colonial movement began to engage in protecting the natural environment in the African and Pacific colonies from the 1890s. Most historians explain these initiatives from a German-centric perspective. By integrating the discourses in the Indian Ocean region and by contextualising them on the timeline, however, it can be demonstrated that an awareness of environmental problems, in particular of the destruction of tropical forests and of climate change and its consequences, developed slightly earlier in the context of species transfer across the Indian Ocean and that it had an impact on the German colonial movement that should not be neglected.

\textsuperscript{76} George P. Marsh, \textit{Man and Nature; or, Physical Geography as Modified by Human Action} (New York: Charles Scribner, 1864); for the important role of Marsh in nineteenth-century discourse on climate change, see Brett Bennett and Gregory Barton, ‘The enduring link between forest cover and rainfall: A historical perspective on science and policy discussions’, \textit{Forest Ecosystems} 5 (December 2018): 3, doi.org/10.1186/s40663-017-0124-9.


The German scientists who engaged in species transfer in the Indian Ocean region were leading protagonists of tropical forest conservation. Mueller, Brandis and others participated in discourses about environmental destruction in the region and were reporting back to Germany their findings from the 1860s. Their correspondents in Germany, most of them influential scientists, propagated the reports they received from the Indian Ocean region in publications that were relevant to the colonial movement in Germany. For example, Mueller had praised the qualities of Australian trees in his correspondence with scientists in Germany since the 1860s and advocated their transfer to the African deserts. In these letters, he also promoted the foundation of German colonies in Africa, and he wrote that he had participated in building a forest bureaucracy in Australia together with the German-born Australians Richard Schomburgk and Friedrich Krichauff in the 1870s, at a time when political interest in overseas colonisation and, as a consequence, in ecological interventions in Africa and Asia was very limited in Germany.

In the 1880s, Mueller and Brandis corresponded with colleagues in Germany and in the newly established German protectorates in Africa about the transfer of species and about forest protection. Brandis, for example, encouraged German officials and wider German audiences to support the cultivation of Indian bamboo in German East Africa. The planting of Australian trees in the African colonies was discussed by German colonial officials, and Mueller’s initiatives played an important role in these discussions. Mueller was also a correspondent of Engler, who, in his publications, referred to the destruction of tropical forests in East Africa in the same dramatic style as Marsh. In his letters to Ferdinand von Krauss at the Museum of Natural History in Stuttgart, Mueller reported that it had become increasingly difficult to acquire samples and skeletons of indigenous Australian animals to send to colleagues, because they were ‘mercilessly destroyed and kicked out of god’s creation’ by the European settlers.

79 Beattie, Empire and Environmental Anxiety, 123–49.
80 For some early examples, see Ferdinand von Mueller to Carl von Martius, 27 August 1867, in Regardfully Yours, ed. Home, 2:429; Ferdinand von Mueller to August Petermann, 26 November 1865, in Die Erforschung Australiens, ed. Voigt, 75.
83 See, for example, H. E. Gast to the Kolonialwirtschaftliche Komitee in Berlin, 3 July 1914. R 1001/7736. Bundesarchiv Berlin–Lichterfelde.
The awareness of environmental destruction that developed in the context of the transfers across the Indian Ocean thus had an impact on initiatives for environmental protection in the German colonies. It also contributed to the rising sensitivity for the environmental problems in Africa, Asia and the Pacific world and, as a consequence, to the making of colonial bureaucracies for environmental conservation.

The globalisation of periodisation schemes can thus help to develop new chains of causation. If we give up national, long-term teleologies, such as the paradigm that environmentalism in the nineteenth-century German colonial movement was initiated by developments and traditions within Germany alone, and turn towards short-term global perspectives, we can find new dimensions and new explanations for historical problems that have often been analysed from within a European context only. This article, therefore, not only aims to show that European chronologies and time regimes changed when they were contextualised within the temporal dynamics of non-human participants in the transfers, but, more importantly, that we can explain causal connections and questions of ‘origin’ in innovative ways if we define global horizons of time.

Conclusion

This article has demonstrated that examining the timescapes of species transfer across the Indian Ocean can enhance our understanding of global environmental history in many ways and therefore deserves further scrutiny. Different aspects of measuring and perceiving time, the conceptualising of present activity with respect to the future and the past, the search for origins in processes of migration and mobility, and the defining of long-term continuities and short-term breaks were significant categories of self-fashioning for the participants in the transfers. At the same time, they are important analytical categories for their historians.

European scientists temporalised species transfers they initiated in different ways. They defined themselves as modernisers and identified their transfers as contributions to Western progress. They shifted space–time relations and moved time frames to legitimise their own transfers with respect to non-European exchanges across the Indian Ocean. In the course of the transfers, however, plants and animals developed their own temporal agency. Their life rhythms and speeds of growth did not always coincide with the expectations of colonial audiences. Introduced plants and animals sometimes spread rapidly and damaged rather than improved colonial agriculture. Scientists lost control over the transfers they had initiated and realised that there were limits to their eco-engineering. At the same time, scientists emphasised that species transfers were to be considered as experiments. In contrast to the civilising mission,
which had a clear destiny, the concept of the experiment implied that the future was open and that the outcome of the transfers could not be predicted. Transfers that the colonists regarded as failed, could be justified and appeared manageable.

Furthermore, this article argues for a more nuanced periodisation and detailed space–time analysis to investigate the temporalities of transcontinental species transfer. Defining fine layers of time shows how regional concentrations within the Indian Ocean arena shifted in the decades before the First World War. It helps to relate long-term processes and continuities to discontinuities and condensations and to identify synchronicities and assynchronicities in the networks.

Analysing chronologies in this way also allows historians to relate Indian Ocean transfers to wider-reaching imperial and global networks. If we apply a narrow time frame and establish fine layers of time across long geographical distances rather than taking the long-term perspective of the Anthropocene in the frame of national history, we can create innovative causal connections on the global scale and come to unconventional conclusions about the motivations, impulses and contexts of the transfer of species and ecological knowledge. Although, for example, it has been carefully examined that German Humboldtians brought their own ideas about environmental conservation to the British colonies and India, the transfer of ideas in the other direction, from the German scientists in the Indian Ocean region back to Germany, has been neglected so far. This article suggests that concerns about ecological destruction that were shaped by the preconditions of exploring the Indian Ocean region have influenced discussions about colonialism and ecological destruction in Germany since the 1860s. Examining these transfers on the timescale contributes to a more differentiated approach to the problem of when and where patterns of thinking changed and in how far it is possible to locate the origins of 'modern' environmentalism. It is, therefore, important to question the periodisation of national history and to integrate transcontinental and non-human temporalities. In this way, we can make the timescapes of species transfer across the Indian Ocean visible and shed new light on global ecological change in the age of empire.