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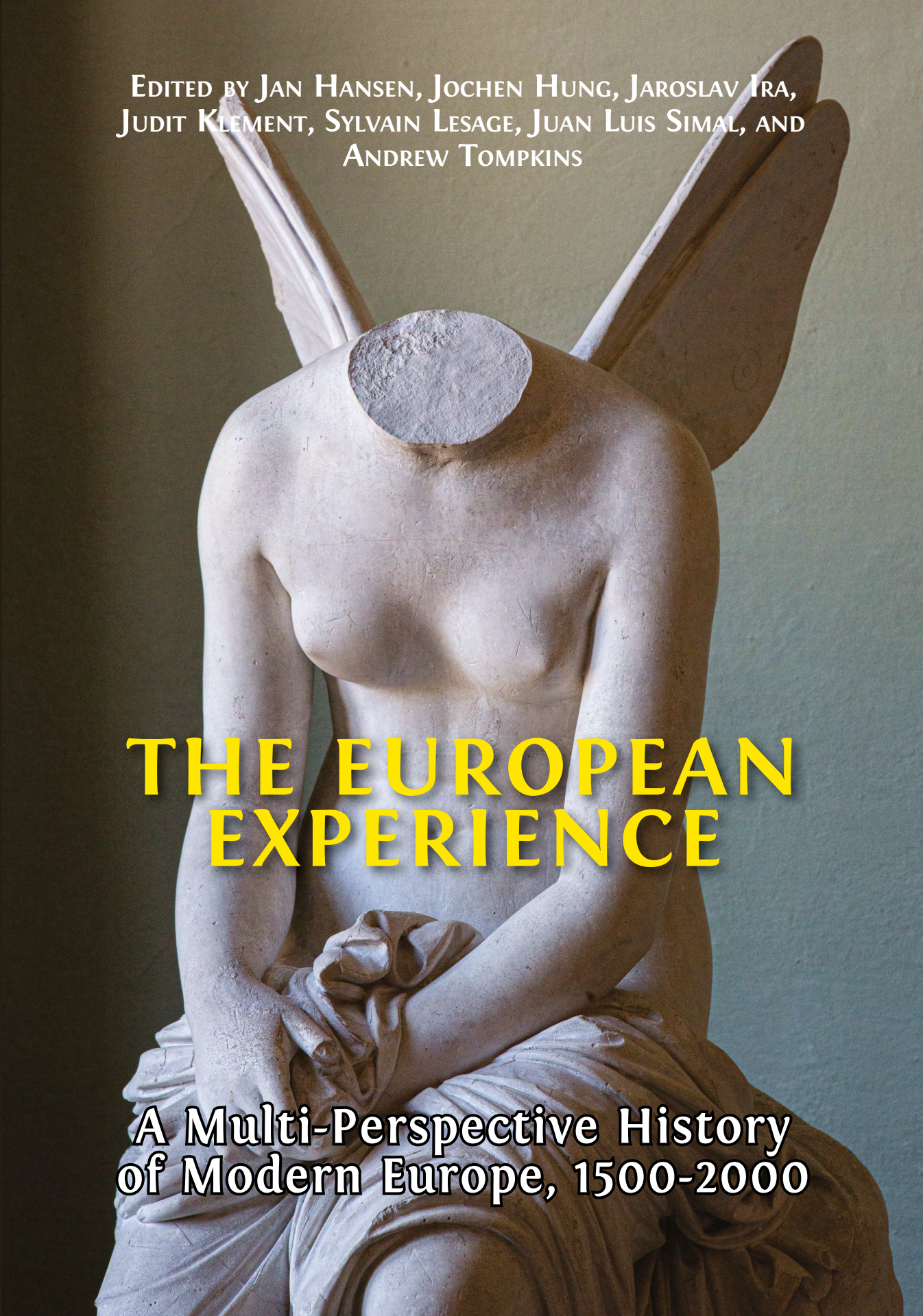

The European Experience

A Multi-Perspective History of Modern Europe, 1500-2000

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4.4.1 Understanding and Controlling the Environment in Early Modern History (ca. 1500–1800)

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Introduction

In early modern Europe there were not many 'natural' landscapes in the sense of nature untouched by man. Almost everywhere, the environment had been modified by human land use, technology, or anthropogenic climate change. While Europeans had been interacting with their environment since prehistory, in the early modern era the pace and magnitude of human interventions increased. Intensified exploitation of natural resources gave rise to transformations of the environment that affected the entire continent, and in some respects the world beyond Europe as well. Attempts were made to overcome the dangers posed by the environment, for instance through the construction of dikes to prevent flooding. Attitudes towards the environment also changed: Europeans increasingly felt that man should and could control and manage the natural world. These changes were related to a number of developments characteristic for the era. Population growth and urbanisation, industrialisation, commercialisation and the growth of long-distance trade all contributed, as did the formation of increasingly powerful states able to initiate action. The scientific revolution of the sixteenth and seventeenth centuries also played an important role. It allowed Europeans to acquire a better understanding of the world around them and provided them with new technological means to exploit and control it, as is demonstrated by the use of new engineering techniques in the construction of canals.

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Natural Resources and the Transformation of the Environment

The early modern era witnessed an expansion and intensification of the extraction of natural resources across the continent, for direct consumption (fish, game, food crops), construction (wood, stone, clay), fuel (wood, peat, coal), fertilisation (bird excrements, ashes) and various industrial uses (ores, minerals, industrial crops). This process was associated with demographic growth and the emergence of merchant capitalism in north-western Europe. Demographic recovery after the recurrent plague epidemics of the fourteenth and fifteenth centuries was generally very slow, but there were important regional differences. The urban areas of north-western Europe, such as the Low Countries and the London region, experienced a steep rise in population. These regions soon faced the problem of feeding their populations using regional agriculture and required food imports, while simultaneously developing an economy based on manufacturing and trade. Reaching the limits of traditional local supplies, methods of production and established trade networks, Dutch and English merchants moved their attention initially to adjacent areas, but from the mid-sixteenth century predominantly to more distant sources in the Baltic region and overseas.

Practices of mass production of crops and the exploitation of nature for exports emerged in peripheral parts of Europe, significantly altering local environments. A good example is the exploitation of woodlands. Wood represented a critical resource in the development of early modern European societies, and the economist Werner Sombart (1863–1941) even coined the notion of the 'Wooden Age' to emphasise this. While England gradually turned to coal and the Netherlands relied on peat from the late Middle Ages onward, wood remained indispensable as a fuel in most of Europe. It was also irreplaceable as a raw material for various industries, in the form of charcoal (for smelting and iron forging) and potash (a by-product of burning utilised for textile manufacturing and glass melting). Furthermore, a steady supply of timber was required for the construction of housing in growing urban centres, to fuel mining rushes, and in shipbuilding as a necessary precondition for maritime trade and war—it has been estimated that the construction of one seventeenth-century warship consumed twenty-four hectares of mature forest.

Some areas in Europe witnessed a considerable reduction of woodland areas: France lost fifty percent of its forests between 1550 and 1789, Denmark almost two thirds between 1600 and 1750 and Ireland and Spain lost their forests almost entirely. Deforestation and parallel population growth drove wood prices up: the firewood necessary for cooking was sometimes more expensive than the meal itself. In response to the great demand for wood, central and northern Europe witnessed the development of systematic forest

management in the seventeenth and eighteenth centuries, with the aim of maximising yields (and profits). Based on scientific criteria, forest planners created monocultures and planted trees in rows separated by corridors, thus making forests manageable. Transport of the wood to distant markets made use of a timber rafting infrastructure. While this rational approach limited deforestation of the continent to a certain extent, it also prevented traditional cooperative agricultural uses of forests for the provision of winter fodder, tillage and forest grazing, and transformed large areas of European woodlands into private plantations.

Expanding markets and long-distance trade sparked a large-scale commodification of nature and induced significant changes in land-use patterns. European entrepreneurs were involved in land reclamation in north-western Europe (the English Fens, the Dutch polders) and the Mediterranean (the Venetian Lagoon) and also explored new opportunities overseas. With improving sea transportation, they became able to develop plantation economies in tropical regions, including attempts at timber production. Species imported from the 'New World' altered the traditional diet of Europeans and due to their resistance to local pests provided a reliable source of calories. The ensuing complex 'Columbian Exchange', characterised by a mixing of the hitherto largely separated biological life of the American, African, and Eurasian continents, marked a distinctive step towards the development of a global agricultural market.

An additional push towards change in traditional practices of nature management in Europe came from the natural world itself. The period of climate cooling known as the 'Little Ice Age', characterised by harsh and freezing winters, brought about significant changes in agricultural production. Viticulture disappeared from some of the less favourable regions and in northern Europe grains were partly replaced by the cultivation of the more cold-resistant potatoes. While only a small group of Europeans engaged in resource exploitation associated with long-distance trade, many farmers, peasants, and fishermen had to cope with often fundamental changes in their agrarian ecosystems caused by natural factors.

Coping with Risks

As suggested by the impact of the Little Ice Age, the environment of early modern Europe could pose risks to human lives and livelihoods just as well as it could provide essential resources. Although these risks often originated in natural phenomena such as the weather (storms, floods or droughts), seismic activity (earthquakes, volcanic eruptions) or biological incidents (epidemics), their ultimate impact depended on the interaction between man and the environment. In fact, many risks were caused, or at least exacerbated, by

human exploitation of natural resources. In fifteenth- and sixteenth-century Holland, for instance, digging peat for fuel created large inland lakes that eroded the shoreline during inclement weather.

Early modern societies responded to environmental risks in various ways, employing both new and traditional methods. People often learned from experience, especially where hazards were repetitive and predictable: they anticipated recurrences and adjusted to the situation, finding ways to live with risk. Conversely, there were also attempts to reduce threats by actively transforming the environment. This often involved new technology, which required coordination, capital, and expert knowledge. The development of flood defences in Holland is a good example. Diking to protect the land from flooding had started in the high Middle Ages. The first dikes were small-scale affairs, constructed and maintained by local communities. Over the centuries, short dike stretches were connected, raised, and reinforced. Maintenance, originally in the hands of farmers, was increasingly professionalised and entrusted to designated regional organisations, called 'waterboards'. Improvements in milling technology allowed for better drainage. Especially between ca. 1550 and 1660, large areas were reclaimed and transformed into agricultural land. Funding was often provided by merchant companies, while technological expertise increasingly came from qualified surveyors. In the seventeenth century, many of them had received formal training at the school for (military) engineers at Leiden University established in 1600—forerunner to the technical schools that in the eighteenth century were also to appear in other European countries.

Fig. 1: Anonymous, "De slechte toestand van de Zeedijk vanaf Diemen tot aan Jaap Hannes (tweede deel)" ("The poor condition of the Zeedijk from Diemen to Jaap Hannes (second part)") (1705), Public Domain, Rijksmuseum.nl, http://hdl.handle.net/10934/RM0001.COLLECT.472534. In this image from the early 1700s, a dike protects farmland in the northern Netherlands from pervasive flooding.

Attempts to prevent or at least contain the outbreak of epidemic disease showcased a similar mix of traditional and new methods. Throughout the period, cities and states everywhere in Europe combatted the many outbreaks of infectious diseases by issuing regulations aimed at isolating the sick, imposing hygiene in public places, and restricting trade with the outside world. Such measures could be quite effective if they were strictly enforced—which was not easy. New methods, adopted from the Middle East, were employed in the fight against smallpox: from at least the early eighteenth century onward, forms of variolation were practiced in various parts of Europe. Healthy individuals were inoculated with small amounts of pus or scabs from a smallpox patient in order to trigger a mild case of the disease, gaining immunity in the process. The practice was not without risks, but through trial and error doctors gradually refined variolation methods, reducing the number of casualties. One of these doctors, Thomas Dimsdale (1712–1800), published his method in 1767/1768. Variolation paved the way for the next step, which followed at the very end of the century: experiments by the English physician Edward Jenner showed that inoculations with the relatively benign cowpox virus also conferred immunity against smallpox.

Technology and the State

Early modern societies experienced a dramatic technological change inextricably linked to their increasing control over the environment. Two major lines of development were important. First, the scientific revolution of the sixteenth and seventeenth centuries led to a more comprehensive and precise grasp on the environment. Statistics show a surge in scientific discoveries and technological inventions between ca. 1500 and 1700. With physics and chemistry providing new models and categories for understanding the environment, and scholars such as Galileo Galilei (1564–1642), Johannes Kepler (1571–1630), and Isaac Newton (1643–1727) publishing foundational works that would help tame natural forces, the early modern age also saw the introduction of prototypes of calculating devices and telescopes, which would fundamentally alter human understanding of the environment. Second, this process was embedded in the larger context of empire and conquest. As mentioned earlier, the early modern period was an epoch in which humans were constantly expanding their radius of movement and intervening more and more in both indigenous civilisations and ecosystems. The 'discovery' of America is just as much a part of this story as the technological penetration of hitherto sparsely explored European peripheries.

Early modern Europeans used both new and old technologies to adjust the environment to their needs. New scientific methods and bodies of knowledge, as well as new scientific discoveries and associated technology, aided the

control and exploitation of the environment to a previously unforeseen extent. The construction of advanced infrastructural works, such as roads and canals, illustrates this. Some of these works were great feats of engineering, such as the Canal du Midi between the Atlantic Ocean near Toulouse and the Mediterranean Sea near Vauban, completed in 1681. The canal crossed the European watershed and helped circumvent the long and arduous journey around the Iberian Peninsula. This was only possible thanks to technological advancement in the use of hydraulics and the construction of a number of locks. The Canal du Midi was a transformative intervention in the natural waterways of the region, and allowed for a great simplification of trade routes from the seventeenth century onwards.

A century later, technological innovations such as the steam engine, the spinning machine or the mechanical loom helped develop new forms of industrial production, first in England and then in Belgium and the German lands, resulting in further alterations of the environment in these regions. Resource extraction both intensified and changed: coal mining in particular increased rapidly, making use of newly developing techniques for underground mining. Early forms of industrialisation were inextricably linked to the growth of cities, long before nineteenth-century urbanisation took shape. New urban centres emerged, for example, in the Ruhr region and existing towns across Europe changed fundamentally. These processes were not only linked to technology, but also to ever-unpredictable natural crises. Disasters such as the destruction of Lisbon by an earthquake in 1755 triggered a profound transformation of both built environments and people's religious beliefs and value systems. The earthquake brought with it devastating fires and a tsunami, destroying the Portuguese capital almost entirely and shocking contemporary eyewitnesses. Nonetheless, despite this devastation, the city's reconstruction was remarkable in its scale and ambition. A truly new city was planned and built, with wide and straight alleys and large squares. More importantly, earthquake-resistant construction methods were now being developed and implemented.

The intensification of land use, the transformation of environments and more sophisticated extraction of natural resources which characterised the early modern era were accompanied by a change in statehood and state power. As technological expertise grew, so did the reach and power of state authorities over populations and over the environment. Human interventions into the environment were frequently initiated or stimulated by states that simultaneously increased their own scope of action. Early modern forestry again provides a good example: the introduction of rational forest management in the seventeenth and eighteenth centuries owed much to attempts to supplement state revenues. In the words of political scientist and anthropologist James C. Scott, the state made both nature and populations

'legible', i.e., it rearranged them according to the needs of government. Parallel to the intervention in the environment, authorities developed early forms of state bureaucracies, which enabled them to gain more oversight and access to individuals and the environment.

Changing Attitudes

In the early modern period, the theology of nature was the dominant discourse regarding the relation between man and environment. Nature was considered God's creation and natural disasters were seen as an expression of God's punitive wrath or as his warning to compel people to change their behaviour. It would be wrong to think that the scientific revolution produced a discourse of rationalism that was antagonistic to this providentialism. Even though the French philosopher René Descartes (1596–1650) wanted "to make man master and possessor of nature", he saw God as the "great Horologist", the One who invented the mechanism of Nature and gave it its initial impetus. For Descartes, living as a good Christian was a condition for avoiding natural disasters and successfully farming the land.

Nevertheless, attitudes changed from the late seventeenth century onwards. Increasingly, states, communities and individuals did not leave their survival up to divine intervention, but actively worked to prevent natural disasters and mitigate their impact. For example, the development of probability calculation about human mortality by the English statistician John Graunt (1620–1674) and the Dutch physicist Christiaan Huygens (1629–1695) allowed for the development of the insurance system: in 1686, Lloyd's was founded in London and in 1698 the first life insurance contracts were established. Drawing up and implementing specific regulations was another way for the state and cities to protect the people at risk. For example, after the Great Fire of London (1666), new regulations on urban construction were adopted all over Europe—thatched roofs and wooden houses were banned, minimal distances between houses were established, and chimney sweeping became compulsory.

It was not only the state that acted: changing attitudes also came from below. During the eighteenth century, some farmers and peasants tried to improve yields (and avoid starvation) by cultivating their fallow land with new crops such as potatoes and leguminous plants, which allowed for the regeneration of the soil, and also by using urban dung as fertiliser, thus challenging limits to population growth. The eighteenth century also witnessed an 'olfactory revolution'. Urban elites could no longer tolerate strong smells, which were described as a danger to health. Thus, washing the body became a social expectation. Meanwhile, the authorities adopted regulations for collecting urban waste and moving cemeteries outside the city limits. In this context

of early hygienism, the social images of nature evolved: in Great Britain, the aristocracy left the dirty city for the safe countryside and all over Europe the mountains, which had long been rejected, became fashionable for their supposed therapeutic virtues.

Another significant change in attitude towards the environment concerns the measures introduced by states to counteract the negative consequences of the exploitation of natural resources. Ideas of sustainability were primarily applied to the issue of wood management. As the use of wood increased, particularly in shipbuilding, it became a precious and strategic resource. The Republic of Venice had already set an example in the fifteenth century with the creation of an administration for the forest resources of its hinterland. In France, the edict of 1669 on water and forests created royal oak groves and a forestry administration with sustainable methods. During the following century, state forestry methods would also be implemented by private owners and landlords in order to protect their properties: in England, the adoption of the *Black Act* in 1723 aimed to protect royal and private forests from all acts of delinquency—which were now punishable by death. Rural communities were thus evicted from the forest and its uses.

In the second half of the eighteenth century, we can observe the first signs of a growing awareness of the need to preserve nature for its own sake. This awareness grew in the European tropical colonies after the 'ecocides' committed to establish a plantation economy during the previous century. The fashionable theory of desiccation highlighted the interplay between vegetation and climate change: aridity appeared as the consequence of the lack of rainfall caused by deforestation. Then, in Mauritius, in 1769 the French botanist and colonial administrator Pierre Poivre (1719–1786) led "an environmental moral economy" based on a policy of forest conservation and the acclimatisation of new plants to put an end to the destruction of nature. For British historian Richard Grove, this conservation policy constituted "the invention of ecology in the colonies".

Conclusion

Early modern Europe witnessed an intensification and expansion of human exploitation of the environment. Europeans controlled, managed, and exploited the world around them on a scale unknown until then, aided by growing state power. This would not have been possible without a good understanding of the environment. Learning about the environment and finding out how best to deal with it was partly a matter of everyday experience, but in the early modern period old methods were increasingly supplemented by new ones that relied on scientific discoveries, novel technologies, and rational application

of knowledge. The acquisition of knowledge and changing attitudes towards nature developed in tandem: despite persistent providentialism, the belief that man could and should control the natural world gradually gained ground.

Greater control of the environment raised production, improved living standards, and offered protection from risks, but it also had negative effects. Intensive exploitation of natural resources could destroy landscapes and ecosystems, inadvertently creating new risks and disrupting communities. In a world increasingly shaped by international trade, these effects were felt over long distances. It is perhaps not a coincidence that some of the first concerted efforts to preserve nature were made in Europe's overseas colonies.

Discussion questions

1. Was the intensification of the extraction of natural resources in early modern Europe a consequence or rather a cause of an expanding long-distance trade?
2. How and why did the concept of 'nature' change in early modern Europe?
3. Most people are very much aware of the fragility of our ecosystems today. Do you see any roots of this awareness in the early modern era?

Suggested reading

Crosby, Alfred W., *The Columbian Exchange: Biological and Cultural Consequences of 1492* (Westport, CN: Praeger, 2003).

Grove, Richard, *Green Imperialism. Colonial Expansion, Tropical Island Edens and the Origin of Environmentalism, 1600-1860* (Cambridge: Cambridge University Press, 1995).

Marks, Robert. B., '"Exhausting the Earth": Environment and History in the Early Modern World', in *The Cambridge World History, vol. VI,* ed. by Jerry H. Bentley, Sanjay Subrahmanyam and Merry E. Wiesner-Hanks (Cambridge: Cambridge University Press, 2015), pp. 29–53.

McNeill, J. R., 'Energy, Population and Environmental Change Since 1750: Entering the Anthropocene', in *The Cambridge World History, vol. VII*, ed. by J. R. McNeill and Kenneth Pomeranz (Cambridge: Cambridge University Press, 2015), pp. 51–82.

Radkau, Joachim, *Wood: A History* (Cambridge: Polity, 2012).

Warde, Paul, *The Invention of Sustainability: Nature and Destiny, c. 1500–1870* (Cambridge: Cambridge University Press, 2018).