



Morgan, J. E. (2022). Environments. In B. Kümin (Ed.), *The European World 1500-1800: An Introduction to Early Modern History* (4th ed., pp. 29-38). Routledge. <https://doi.org/10.4324/9781003140801-5>

Peer reviewed version

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[10.4324/9781003140801-5](https://doi.org/10.4324/9781003140801-5)

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Environments

John Morgan

Ecological destruction, deadly epidemics, accelerating fossil fuel consumption and a changing climate: these are some of the challenges of the twenty-first century. And yet Europe has been here before. Early modern Europe both drove and experienced environmental processes which have striking parallels, and some fundamental differences, to those of our present moment. The actions of early modern Europeans profoundly shaped global ecologies and set in motion forms of economic development which continue to affect environments today, but all in the context of a cooling, not a warming climate. The field of environmental history studies how people and their environments entangled and interacted over time. Histories of Europe in this vein have roots in the French *Annales* school of social and economic history, and have continued to grow in influence and popularity with the flourishing of the environmental movement since the 1970s and the deepening of contemporary environmental crises.

The Little Ice Age

In the early modern period, Europe was generally slightly cooler than it is today. Between the late Middle Ages and across the early modern period, the world experienced a 'Little Ice Age' (LIA), so named for the advance of glaciers across the world to their greatest extent in the last 6,000 years (Wanner et al. 2008). Scientists vary

in the exact dates given to this period, but start dates range from 1300 to 1550, and end dates from 1800 to the mid twentieth century. Average temperatures in the Northern Hemisphere were between 1 and 2 degrees Celsius colder than mid twentieth-century averages, caused by a combination of slightly lower solar activity and several tropical volcanic eruptions blocking light from the sun. However, precise average temperature variations can be deceptive. They should not give the impression that the LIA was just cold. Within this long period there was significant temporal and regional variation ('Environment and Society Timeline' in web resources). Europe experienced some of its hottest and coldest moments during the LIA: the summer of 1540 was so hot that in the streets of Besançon, France, people took refuge in basements from early in the morning, and forests and grassland self-ignited in Switzerland, Alsace, and Germany (Wetter and Pfister 2010), while the coldest winter came in 1709 (Box 1). Even these extreme weather events were experienced differently across Europe: as the Duchess of Orléans froze in Versailles, Scotland, Ireland, and the northernmost parts of England escaped with relatively mild weather. The LIA was then a period of generally lower than average temperatures but was neither just cold nor universally cold.

Box 1:

[19 January 1709] 'You hear nothing but complaints about the cold, there has not been such a winter in living memory. During the last fortnight people have been found dead of cold every morning, and the partridges are picked up frozen in the

fields. All the plays have been stopped and so have all the law-suits, for the judges and the advocates can't sit in their chambers because of the cold.

(Kroll, 1971, 133)

Correspondence of Charlotte-Elisabeth, duchesse d'Orléans, writing from Versailles.

For an account of a severe English winter see additional website source 1.

The effects of the LIA were by no means 'little' for early modern European society. Lower than average temperatures meant shorter growing seasons for key crops, and successive cold, wet summers led to stress on local food availability. For example, the late sixteenth and early seventeenth century have been characterized as a 'hyper-LIA' (**Figure II.1 near here**; Le Roy Ladurie 2004, 202), with particularly rapid glacial advances, and a series of cold and wet summers in the 1590s causing hardship across Europe. Other LIA crises were more immediately manifested: a violent storm surge caused the Christmas Flood of 1717, killing more than 11,000 people on the North Sea coast from Groningen to Schleswig. Such crises were often climatic in origin but could only become social crises as they played out through the arrangement and distribution of power and resources within societies (Soens 2018). In marginal and frontier environments, environmental crises had particular features. On the Venetian-controlled Mediterranean island of Crete, climatic disturbance exacerbated stresses brought on by conflict with the neighboring Ottoman Empire. Between 1548 and 1648, climatic extremes including damaging winter droughts in 1555-56, 1563-66 and 1588-96 caused famines, while excessive cold and rain in 1602 and 1605 disrupted agriculture further. During dearth years, rival Ottoman merchants could cease trading grain with the island,

furthering hardship and weakening the Venetian ability to defend against Ottoman advances, which eventually succeeded in 1648 (Grove 2004, i, 376).



Figure II.1 The early seventeenth century was particularly cold in Europe, freezing the Thames in England and many canals in the Netherlands. For all the hardship such conditions brought, deep freezes also provided opportunities for frost fairs and sports. Hendrick Avercamp, 'Ice Scene' (c.1610). Mauritshuis, Den Haag.

Historians continue to debate how far environmental factors caused more widespread social and political crises, particularly for the period around the mid-seventeenth century. Until recently, the focus lay on endogenous European factors such as the long reformation, contingent composite monarchies or the growing pains of capitalist economies. However, the scope of this so-called 'General Crisis' has been expanded by environmental historians, notably Geoffrey Parker, to become a 'Global Crisis'. The inclusion of Asia, the Americas and parts of the Middle East and West Africa coincided with new climate reconstructions for the period which show the mid-to-late seventeenth century to be a low point for global temperatures, as the Little Ice Age reached its

coldest point during the MAUNDER MINIMUM. This environmental stimulus, for Parker, contributed to a 'fatal synergy' (2013, 685) of conditions which precipitated crisis; low temperatures and shorter growing seasons placed stress on food supply, bad weather was interpreted providentially and contributed to political unrest, and centre-periphery relations became strained amidst a generally less favourable climate. This analysis is not without its critics but does emphasize some of the practical constraints placed on early modern states in a period of global cooling.

Columbian Exchange

European contact with the Americas ('Europe overseas' in Part IV) initiated deep changes in environments on both sides of the Atlantic. These processes have been termed 'the Columbian Exchange' and 'ecological imperialism' by environmental historian Alfred Crosby (2003 and 1986). The former refers to the transfer of plants, animals, micro-organisms and diseases between Afro-Eurasia and the Americas in the period after Christopher Columbus made contact in 1492. That transfer was by no means equal, willful, or consensual: European colonists unwittingly transferred diseases to the Americas which greatly aided colonization. Many indigenous populations across the Americas suffered dramatic collapses (some up to ninety per cent) in the century post-contact, often because of European-introduced infectious diseases such as smallpox, measles and tuberculosis ('Expanding horizons' in Part IV). Susceptibility to disease was increased by malnutrition and social dislocation brought on by conflict with Europeans, as well as the ecological disruption caused by European plants and animals. Deliberately introduced species such as cattle, sheep and domesticated horses thrived on American flora, which fundamentally changed American landscapes (Melville 1994).

Those landscapes shaped European animals in return: cattle proliferated and ranged widely across upland south America, where in eighteenth-century Paraguay, they were observed to be lean, agile, and resistant to milking with a ‘ferocious arrogance’.

Following in the footsteps of European animal species, often quite literally, were European plants transported in ballast, grain sacks and intestines, such as the Broadleaf Plantain (known as the Englishman’s foot), which spread rapidly without their accustomed competitors and predators (Crosby 1986, 179 and 169). Plant and animal transfers such as these were part of a ‘biological expansion’ of European flora and fauna across the globe.

The unequal exchange between Continents also involved the transfer of useful natural resources back to Europe. While early commentators were sceptical about the value of expending energy and resources in a faraway land, early modern governments and merchants came to see the New World as one of abundance and possibility. This is best illustrated by the ‘Second Earth’ (Worster 2016) – the image of the Western Hemisphere placed equal and adjacent to the Eastern in Rumold Mercator’s late sixteenth-century world map. **[Insert Fig. II.2 near here](#)** Key commodities extracted from the New World included hard woods (particularly in forested coastal regions of Brazil), precious metals (particularly from the silver mines at Potosí) and furs (particularly from across northeastern America). Plant species were introduced to Europe from the Americas, and became important staples in the diets of working people; key among them were maize and potatoes, which Adam Smith called ‘the two most important improvements which the agriculture of Europe, perhaps which Europe itself, has received from the great extension of its commerce and navigation’ (Smith 1776, i, 305; ‘Food and Drink Cultures’ in Part V).

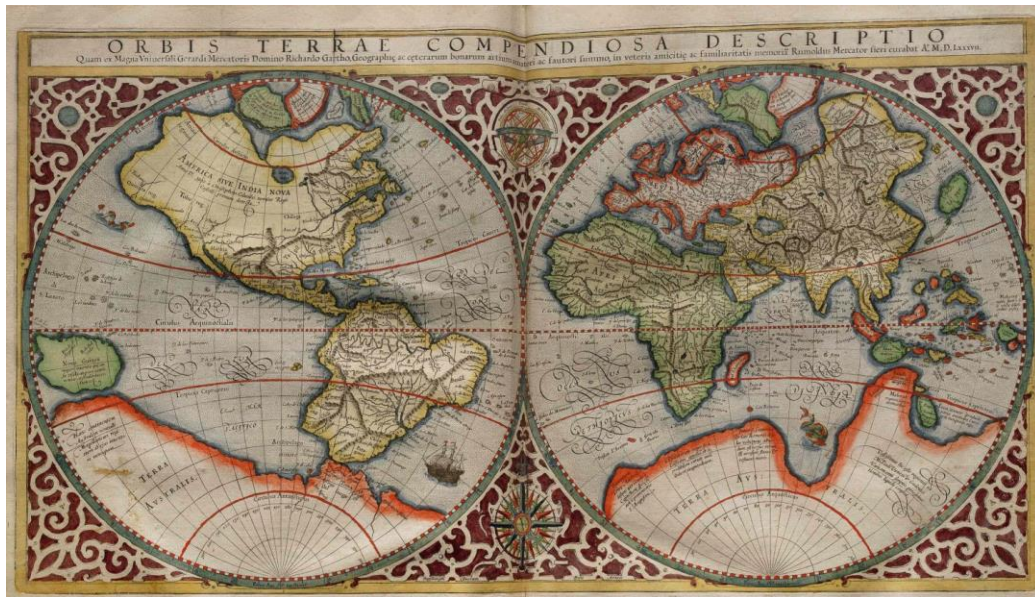


Fig. II.2 The ‘second earth’ in Rumold Mercator’s world map was understood as an enormous reservoir of resources which early modern Europeans could exploit. Such attitudes required imagining the Americas as un- and under-exploited, and – sometimes explicitly – worked to exclude and disenfranchise indigenous peoples (Mercator 1595, sig A1v-A1r). Source: Wikimedia Commons/Library of Congress.

The colonies Europeans founded introduced new extractive and environmentally destructive forms of industry and agriculture. By 1800, Brazil’s millennia-old Atlantic forest ecosystem had begun to collapse after three centuries of logging, gold mining, plantation agriculture and cattle ranching predominantly by Portuguese colonists (Dean 1997). Sugar plantations on Caribbean islands such as Barbados destroyed tropical rainforest habitat, leading to the decimation of land mammals and birds, the leaching of nutrients from soils and the spread of rats and introduced plant species (Watts 1987). But rarely were European colonizers able to succeed in new environments without knowledge learned from pre-existing populations. Tupi knowledge of the location and extent of brazilwood trees was essential in the early years of Portuguese maritime trade and colonization in Brazil.

Energy

Muscle, wood, and flowing water were the primary sources of mechanical power in the period. Draught power from oxen and horses was used for milling, ploughing and transportation, as often in urban as in rural settings. Water drove mills and remained crucial for early industrial manufacturing into the later eighteenth century, while wood constituted the primary heat source for most Europeans throughout our period.

However, early modernity witnessed a transition between two quite different energy regimes, moving from an 'organic economy', characterized by the dominant energy sources being plants which photosynthesized light from the sun and embodied it as chemical energy, to an 'advanced organic economy', characterized by the exploitation of the photosynthesis of millennia of plants concentrated in coal. This transition has been characterized as the breaking of the 'photosynthetic constraint', whereby Europeans were no longer reliant on the primary production of useful energy sources, like wood, for heat and light, and could turn to coal (Wrigley 2010). In England, where this transition happened first and fastest, coal overtook wood as the primary fuel source in the first decades of the seventeenth century; by 1600 Londoners consumed on average a ton of coal per person per year (Cavert 2016). Where coal was not adopted early, energy crises ensued: Denmark had insufficient wood resources and ceased producing iron in the seventeenth century and glass in the early eighteenth. It was not until coal was imported at scale that Denmark veered away from economic stagnation and decline (Kjaergaard 1994).

Breaking the photosynthetic constraint had profound consequences both in and beyond the early modern period. Immediately, the use of coal was able to free up land

for purposes other than primary fuel production, meaning woodlands could be converted for agriculture, while cities could grow unrestricted by the supply of wood. In the long term, the turn to fossil fuels that began in the early modern period enabled a form of economic development with dramatic consequences: emissions of carbon dioxide released in the later eighteenth century remain in the atmosphere today.

Landscapes, nature and culture

Early modern Europeans altered and amended their landscapes in unprecedented ways. Deliberate ANTHROPOGENIC landscape change has been a feature of most of human history, however the changes wrought by early modern Europeans at home and overseas represented a significant intensification of prior practices as well as the development of entirely new ones. Schemes were both practical and symbolic: constructed in southern France between 1667 and 1681, the 240 km Canal du Midi linked the Mediterranean and the Atlantic, but was also symbolic of Louis XIV's power, here over nature itself (Mukerji 2009).

Throughout Europe, authorities encouraged the draining of wetlands to increase the cultivable area for arable and pasture. Such schemes disrupted long-established livelihoods, none more so than the *Desagüe* in Spanish America, one of the most ambitious engineering projects, which drained the complex of lakes around Tenochtitlan in central Mexico and put an end to the system of CHINAMPA lake farming practiced by Aztec agriculturalists (Candiani 2014). Early forms of conservation were also attempted. In late-eighteenth century St Vincent, English colonists protected forests believing this would stimulate rainfall to help counteract aridification which had been caused by sugar cane plantations (Grove 1995). Yet environmental history is often the

study of unintended consequences, and none more so than with early modern landscape engineering: the ‘improvement’ of wetlands removed habitat for wading birds and fish, as was the complaint from one anonymous English seventeenth-century balladeer (Dugdale 1662, 391-2; see additional website source 2). Drainage projects were met with fierce resistance from locals who stood to lose their land and livelihoods; the drainage of the East Anglian fens provoked repeated protests and riots during the mid-seventeenth century (Lindley 1982).

Europeans perceived nature through a variety of lenses. Religious faith remained fundamental throughout the period, despite the upheavals of the Reformation and the perceptual shifts that occurred within NATURAL PHILOSOPHY (‘The Scientific Revolution’ in Part V). While Catholics and Protestants disagreed over the exact role of God in the physical world, they shared a belief in nature as a gift of PROVIDENCE, and its aberrations as signs of divine wrath or grace. Historians have come to understand early modern change as less the ‘death of nature’ (Merchant 1980) or DISENCHANTMENT and more a series of re-enchantments, each with different confessional and epistemological emphases (Walsham 2008). As such, we see both strong continuities as well as ruptures in how the natural world is understood across the period. A new appreciation for empirical observation and mechanical explanation could be pioneered by members of the clergy (Ray 1691), while catastrophes like the 1755 Lisbon earthquake, fire and tsunami could provoke both pious exhortations to repent and questioning of the nature of God and His role in the world.

Classical ideas continued to shape how people understood their environments. The dominant Aristotelian-Galenic medical tradition understood the body and the world in a shared HUMORAL schema (‘Sickness and Health’ in Part II). The correspondence

between the elemental properties of landscapes and bodies linked landscapes with characteristics in their peoples: inhabitants of wetlands (cool, moist places) were slow and relaxed ('phlegmatic'), while cold, dry places like uplands made people introspective ('melancholic'). Climate theory also divided the earth into three latitudinal zones – frigid at its polar extremes, torrid at its equator and temperate at the latitudes in between, placing the Mediterranean as the climatically optimal location for civilization.

Landscape and livelihood were read through a moral lens which lent ecological regions distinct and sometimes caricatured identities. The Dutch coastal landscape was a product of centuries of draining and embanking and required constant investment and attention to maintain its productivity. As such, the well-drained POLDERS were synonymous with hard work and godly labour, whereas wet and boggy grounds were seen as a moral failure. Links between cultural identities and landscape types are equally apparent in the Alps (Box 2).

Box 2:

'that our countryman does not lack industriousness, we are persuaded by countless proofs. We see him working the most thankless toil with unwearying diligence; he does not regret the toil of once more dragging up the almost annually descending earth on his back onto the steep fields in order to obtain the old fertility of the upper part of his field. He shows no hesitation to extend the fertility of the earth to the steepest heights of the mountains, although these, since ploughing is not possible because of the great steepness, must be worked by laborious hewing with the hands alone.'

(Mathieu 2019, 51-52)

From a description of Tyrolean peasants in 1677.

Assessment

Nature and environment in the early modern period look very different from today. Europeans lived in a cool and often cooling climate, having to contend with shorter growing seasons and the consequent stresses placed on markets and states. Throughout the period much of the world was unknown, and in the process of getting to know it Europeans changed it, sometimes unwittingly, with the plants, animals, and pathogens they brought in their wake. Organic energy sources remained critical to the early modern economy yet began to be replaced by fossil fuels at different rates in different places, unlocking the potential for urban and industrial growth. And how people understood their environments drew on fundamentally different assumptions about how nature operated and influenced them. The Columbian exchange was the most important environmental process in the early modern period, as it brought together what Europeans understood as two almost separate worlds, between which contact and biological transfer had only ever been small-scale and piecemeal. But the consequences of environmental change often played out on more-than-human timescales, beyond the early modern period, such as the destruction of Atlantic forests and the environmental consequences of breaking the photosynthetic constraint.

The sources historians have used to understand environmental history range widely. The Little Ice Age has been evidenced with reference to written descriptions of glaciers,

the isotopic content of Greenland ice cores, and the shifting dates of European wine harvests, amongst many other human and natural archives (Historical Climatology in web resources). As such, historians continue to construct and refine their pictures of early modern environments and, in particular, how European societies influenced and were influenced by them.

Discussion themes

1. What role did climate play in the upheaval of the mid-seventeenth century?
2. How important were introduced plants, animals, and pathogens to the European colonization of the Americas?
3. What is the environmental legacy of the early modern period?

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Web resources

Environment and Society Timeline, curated by the Rachel Carson Centre for

Environment and Society: <<http://www.environmentandsociety.org/tools/timeline>>

Historical Climatology, a Georgetown university website sharing interdisciplinary

climate change research: <<https://www.historicalclimatology.com/>>

Appendices

Extended / additional website sources

[Extended text for Box 1]

[10 January 1709] ‘The cold is so grim that words fail me. I am sitting in front of a roaring fire, there is a screen in front of the door, my neck is wrapped in sables and my feet are in a bearskin sack, but all the same I am trembling with cold and can hardly hold my pen. I have never known such a dreadful winter in all my life; the wine is frozen solid in the bottles.

[19 January 1709] ‘You hear nothing but complaints about the cold, there has not been such a winter in living memory. During the last fortnight people have been found dead of cold every morning, and the partridges are picked up frozen in the fields. All the plays have been stopped and so have all the law-suits, for the judges and the advocates can’t sit in their chambers because of the cold.

(Kroll, 1971, 133)

Correspondence of Charlotte-Elisabeth, duchesse d’Orléans, writing from Versailles.

[Additional website source 1]

‘Countryman

... Your Citie [London] cannot choose but bee much damnified by this strange congealing [freezing] of the Riuer [Thames].

Citizen.

Exceeding much (Father) straungers may _gesse at our harmes; yet none can giue the full number of them but wee that are the inhabitants: for the Citie by this meanes is cut off from all comerce: Shop-kéeperes may sit and aske what doe you lacke, when the passengers may very well reply, what doe you lacke your selues: they may sit and stare on men, but not sit and sell: it was (before) called The dead Terme, and now may wee call this, The dead Vacation, The frozen Vacation, The cold Vacation. If it be a Gentlemans life to liue idly, and doe nothing, how many poore Artificers and Trades-men haue béene made Gentlemen then by this Frost? For a number of Occupations (like the flakes of yce that lye in the Thames) are by this malice of Winter, trod cleane vnder foote, and will not yet bee able to stirre. Alas poore Watermen, you haue had cold chéere at this banquet: you that liue altogether vpon water, can now scarce get water to your hands: it is a hard thing now for you to earne your bread with the sweate of your browes.

Coun.

This beating may make them wise, the want that this hard season driues them into, may teach them to play the Ants, and in Sommer to make a prouision against the wrath of Winter. There is no mischiefe borne alone I know; calamities commonly are (by birth) twinnes: me thinks therefore, y^t this drying vp of the waters, should be a deuourer vp of wood: this colde Ague of the earth must needes haue warmth to helpe it that warmth must come from fier, and that fier cannot be had without cost: how then I pray you in this so generall an affliction, did poore people shift for fewell to comfort them?

Citti.

Their care for fier was as great as for foode: nay, to want it was a worse torment then to bee without meate: the belly was now pinched to haue the body warmed: and had not the Prouident Fathers of this Citie (carefully, charitably, and out of a good and godly zeale) dispersed a reliefe to the poore, in seuerall partes and places about the outer bounds of the Citie, where pouertie most inhabiteth, by storing them before hand with Seacoale and other fiering at a reasonable rate, I verily perswade my selfe, that the vnconscionable and vnmercifull raising of the prices of fewell by Chandlers, Wood-mongers, &c. (who now meant to lay the poore on the Racke) would haue béene the death of many a wretched creature through the want of succour.

Coun.

Not vnlikely Sir.

Cit.

For neither could coale be brought vp the Riuer, neither could wood be sent downe. The Westerne Barges might now wrap vp their smoakie Sayles, for albeit they had neuer so loftie a gale, their voyage was spoyld, the windes was with them, but the tide was cleane against them. And not onely hath this frost nipt away those comforts that should reuiue the outward parts of the body, but those also that should giue strength and life to the inward. For you of the Country being not able to trauel to the Citie with victualls, the price of victuall must of necessity be enhaunced, and victuall itselfe brought into a scarcitie. And thus haue I giuen you (according to your request) a true picture of our Thames frozen ouer, and withall haue drawne in as liuely colours as I can (to my skill) as it were in a little Table, all the miseries, mischiefes, and inconueniences, which this hard time hath throwne vpon our Citie.

... As I haue discouered vnto you, what colde doings wee haue had (during this Frost) in the Citie, so I pray let me vnderstand from you, what kinde of worlde you haue liued in in the Country.

Coun.

The worlde with vs of the Country, runnes vpon the old rotten whéeles: for all the Northern cloth that is wouen in our Country, will scarce make a Gowne to keepe Charitie warme, she goes so a cold. Rich men had neuer more money, and Couetousnesse had neuer lesse pittie: there was neuer in any age more mony stirring, nor neuer more stir to gette mony. Farmers are now slaues to racking yong prodigall landlords, those Landlords, are more seruile slaues to their owne Riots and Luxurie. But these are the common diseases of euery Kingdome and therefore are but common newes. The tunes of the Nightingale are stale in the midle of Sommer, because we heare them at the comming in of the Spring, and so these harsh notes which are sung euerie day in euerie Countrie, do (be custome) grow not to be regarded. But your desire Sir is, to know how we spend the daies of this our Frozen age in the Country.

Cittizen.

That I would heare indéede Father.

Coun.

Beléue mee Sir, as wickedly you must thinke as you can heare in your Citie. It goes as hard with vs as it doeth with you. The same colde hand of Winter is thrust into our bosomes, the same sharpe ayre strikes woundes into our bodies: the same Sunne shines vpon vs, but the same Sunne doeth not heate vs no more then it doeth you. The poore Plough-mans children sit crying and blowing their nayles, as lamentably as the children and seruants of your poore Artificers. Hunger pinches their chéekes as deepe into the flesh, as it doeth into yours here. You cry out here, you are vndone for coale, and wee complaine, wee shall dye for want of Wood. All your care is to prouide for your Wiues, children and seruants, in this time of sadnesse: but wée goe beyond you in cares; not onely our wiues, our children, and houshold seruants, are vnto vs a cause of sorrowe, but wée greeue as much to beholde the miserie of our

poore Cattell (in this frozen-hearted season) as it doeth to looke vpon our owne affliction. Our beastes are our faithfull seruants, and doe their labour truely when wee set them to it, they are our Nurses that giue vs milke, they are our guides in our iourneyes, they are our partners, and helpe to enrich our state; yea, they are the verie vp-holders of a poore Farmers landes and liuings. Alas then, what Maister that loues his seruant as he ought, but would almost breake his owne heart-strings with fighting, to sée these pine and mourne as they doe? The ground is bare, and not worth a poore handfull of grasse. The earth séemes barren, and beares nothing, or if shee doeth, most vnnaturally she kills it presently, or suffers it through cold to perish. By which meanes the lusty horse abates his flesh, and hangs the head, féeling his strength goe from him: the Oxe stands bellowing: the ragged Shéepe bleeting: the poore Lambe shiuering and staruing to death.

The poore Cottager that hath but a Cowe to liue vpon, must feed vpon hungry meales (God knows) when the beast her selfe hath but a bare Commons. He that is not able to bid all his Cattle home, and to feast them with Fodder out of his Barnes, will scarce haue Cattell at the end of Sommer to fetch home his Haruest. Which charge of feeding so many beastly mouthes, is able to eate vp a Country-mans estate, if his prouidence before time hath not bin the greater to meet and preuent such stormes. Of necessity our Sheep Oxen &c. must be in danger of famishing, (hauing nothing but what our old grandam the earth will alowe them to liue vpon) of necessitie must they pyne, scithence all the fruits that had wont to spring out of her fertile womb, are now nipt in their birth, and likely neuer to prosper. And to proue that the Ground hath her very heart (as it were) broken, and that she hath not liuely sap enough in her vaines left as yet to quicken her, and to raise her vp to strength: behold, this one infallible token. The Leeke, whose courage hath euer binne so vndaunted, that he hath borne vp his lustie head in all stormes; and could neuer be compelled to shrink, for Hayle, Snow, Frostes, nor showres; is nowe by the violence and cruelty of this Weather, beaten into the earth, being rotted, dead, disgraced and trode vpon.

This fictitious dialogue between old ‘father’ Countryman and Citizen, of London, dramatizes some of the effects of the extremely cold winter of 1607-8. They emphasize the contrasting burdens and vulnerabilities of the country and the city, and offer moralising analyses of the obligations of the rich to the poor in hard times. The dialogue format is common in early modern topical literature, and news of extreme and unusual natural occurrences was a perennial and popular theme for these small, cheap pieces of print.

Taken from Anon (1608), *The great frost. cold doings in London, except it be at the lotterie. With newes out of the country. A familiar talke betwene a country-man and a citizen touching this terrible frost and the great lotterie, and the effects of them. the description of the Thames frozen over.* London. Sigs. B2-C1.

[Additional website source 2:]

‘Come Brethren of the water, and let us all assemble,
 To treat upon this matter, which makes us quake and tremble;
 For we shall rue it if't be true that Fenns be undertaken,
 And where we feed in Fen and Reed thei'le feed both Beef and Bacon.

Thei'l sow both Beans and Oats, where never man yet thought it,
 Where men did row in Boats ere Undertakers bought it:
 But *Ceres* [Roman goddess of agriculture, grain crops and fertility] thou behold us,
 let wilde Oats be their venture,
 Oh let the Frogs and miry Boggs destroy where they do enter.

Behold the great designe, which they do now determine,
 Will make our bodyes pine a prey to Crows and Vermine:
 For they do mean all Fenns to drain and waters overmaster,
 All will be drie, and we must dye 'cause *Essex*-Calves want pasture.

Away with Boates and Rodder, Farewell both Bootes and Skatches [stilts, for
 crossing wet land],
 No need of t'one nor t'other, men now make better matches;
 Stiltmakers all and Tanners shall complain of this disaster;
 For they will make each muddy Lake for *Essex* Calves a pasture.

The fethered Foules have wings, to fly to other Nations;
 But we have no such things to help our transportations;
 We must give place (oh grievous case) to horned Beasts and Cattell,
 Except that we can all agree to drive them out by Battell.

Wherefore let us intreat our antient water Nurses,

To shew their power so great as t'help to drain their purses;
 And send us good old Captain Floud [send us floods] to lead us out to Battel,
 Then two-peny *Jack* [a pike fish worth two pence], with Skakes on's back [scales on
 his back] will drive out all the Cattel

This noble Captain yet was never known to fail us,
 But did the Conquest get of all that did assail us;
 His furious rage none could asswage, but to the Worlds great wonder,
 He bears down banks and breaks their ranks and Whirly-giggs [windmills] asunder.

God *Eolus* [mythic Greek keeper of the winds] we do thee pray, that thou wilt not be
 wanting,

Thou never saidst us nay, now listen to our canting:
 Do thou deride their hope and pride, that purpose our confusion;
 And send a blast [of wind], that they in haste may work no good conclusion.

Great *Neptune* (God of Seas) this work must needs provoke thee;
 They mean thee to disease, and with Fen-water Choake thee:
 But with thy Mace do thou deface and quite confound this matter,
 And send thy Sands to make dry lands when they shall want fresh water.

And eke we pray thee Moon, that thou wilt be propitious
 To see that nought be done to prosper the malitious;
 Though Summers heat hath wrought a feat, whereby themselves they flatter,
 Yet be so good as send a floud lest *Essex* Calves want water.'

(*Dugdale 1662, 391-2*)

'The Powtes Complaint', an anonymous seventeenth-century ballad, which protested
 the draining of the Fens. 'Powte' is an old English word referring to a number of fish

species, with the usage here likely to refer to the Burbot, a fish which became extinct in England with the draining of the fens (Borlik and Egan 2017). The poem laments the destruction of waterways and wetlands by drainage undertaken so that outsiders can grow crops and graze cattle, and hopes that floods will return to scupper the drainage works.

Borlik, Todd and Egan, Claire (2017), ‘Angling for the “Powte”: a Jacobean Environmental Protest Poem’, in: *English Literary Renaissance* 48, 256-289. .

Glossary

ANTHROPOGENIC – caused by or originating from humans

CHINAMPA – artificial strips of arable land which float on lakes, created and farmed by Nahua people in the Valley of Mexico since the Middle Ages.

DISENCHANTMENT – a theory, associated with German sociologist Max Weber (1864-1920), positing a decline in the belief in supernatural influence in the physical world caused by the Protestant rejection of Catholic sacramental practices.

MAUNDER MINIMUM – a period of low solar activity between 1645 and 1715, with a recorded decline in sunspots, named after English astronomer Edward Walter Maunder (1851-1928).

POLDER – a Dutch term for a drained and embanked enclosure of land, reclaimed from former wetlands or the sea.

Dates

1492	Christopher Columbus lands on Hispaniola
1540	an exceptionally hot and dry summer
1590s	a period of poor harvests and political crisis
1600	eruption of Huaynaputina volcano in Peru
1645-1715	MAUNDER MINIMUM of sunspot activity
1708/9	The Great Winter, the coldest winter in Europe in the past 500 years
1717	Christmas Flood affecting North Sea Coast from Groningen to Schleswig
1755	Lisbon earthquake, tsunami, and fire