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Funding and Organising Flood Defence in Eastern England, c.1570-1700

The routine seasonal tasks of mucking out ditches and hedging sea banks might seem insignificant interventions in coastal processes in the context of rising sea levels, coastal erosion, and accretion unfolding over centuries, and the heft of storm surges capable of reshaping coastlines in hours. However, such actions, undertaken parish-by-parish by non-specialist ad hoc workers, and directed by a revolving cast of part-time unsalaried overseers were some of the main bulwarks against the ravages of the sea in the early modern period. As the late medieval 'Age of Storms' gave way to the tempestuous early modern centuries, much of the English coast fell under the guardianship of men compelled – sometimes unwillingly – into service by their local communities against flood and tide. This paper presents some preliminary conclusions from research into this network of local water managers, and explores the environmental and social causes and consequences of its successes and failures.

Historians of early modern England have paid relatively scant attention to water management. Where water management has seeped in to early modern English history, it has collected around routine and extraordinary endeavours. The field-scale management of water has played a necessary part in the long historiographical traditions of agricultural and landscape history. As Richard Jones highlighted in his contribution to this *settimana*, water management was a fundamental prerequisite for most medieval farming. Traditional open-field farming systems were well adapted to wet conditions, as plots were apportioned between people through systems of ridges and furrows that served a variety of functions, from demarcating individuals' holdings to managing water levels.[1] Early modern historians have produced a number of studies into water meadows as field-scale examples of water management designed to increase hay yields.[2] Far removed from this history of widespread, field-based water management is the study of large scale drainage projects and their impact on local landscapes. This literature has focussed on grand fenland schemes which proved politically contentious in the seventeenth century, and has illuminated the relationships between political culture and wetland communities, state formation and drainage projects, and expertise and early modern

[1] E. KERRIDGE, *The Common Fields of England*, Manchester 1992 (Manchester University Press), pp. 6-11.

[2] *Water Meadows: History, Ecology and Conservation*, H. COOK, T. WILLIAMSON eds., Macclesfield 2007 (Windgather); *Water Management in the English Landscape: Field, Marsh and Meadow*, H. COOK, T. WILLIAMSON eds., Edinburgh 1999 (Edinburgh University Press).

government.[3] Yet between these two extremes there remains a history of water management yet to be written – of local institutions tasked specifically with managing water levels, neither as a by-product of agricultural practice, nor as an instrument of wholesale environmental transformation. Using the archives of one such institution – a Commission of Sewers – this paper explores how people managed water and responded to flood risk in a lowland coastal landscape in the period c.1570-c.1700. By looking at the institutional resources available to them, the kinds of activities they were involved with, and how their work was funded, the paper emphasises the important role of local people in managing coastal landscapes. In doing so it contributes to our understanding of water management beyond the field and away from the fury of the fenland.

Local and regional water management institutions are of more than just local and regional interest because of what they can tell us about the management of risk, the production of disasters and the role of the state in managing environmental processes. Much has been made of the proto-risk societies of the continental European North Sea coast. Marie Luisa Allemeyer and Franz Mauelshagen have evocatively described conditions on the north German coast in which the dictum "Kein Land ohne Deich" dominated local social organisation. Such was the north German reliance on drainage and flood defence by way of communal organisation, that coastal societies have been referred to "as early risk communities, in which protection was from the beginning a matter of self-government and social control by law and order."[4] Institutional arrangements, and the ways in which they reflect prevailing socio-economic inequalities have been shown to have contributed to the prevalence of flood disasters along the North Sea coast, in particular in the so-called 'calamitous Polders' of the Netherlands, as well as in a range of at-risk coastal marshes.[5] Across the North Sea area in the late medieval and early modern periods, the central governments of growing states had to contend and cooperate with longstanding local institutions with often highly evolved political and administrative cultures.[6] The Commissions of Sewers and dikereeves under study here present us with an opportunity to examine all three of these historical issues in water

[3] K. LINDLEY, *Fenland Riots and the English Revolution*, London 1982 (Heinemann); C. HOLMES, *Drainers and Fenmen: The Problem of Political Consciousness in the Seventeenth Century*, in *Order and Disorder in Early Modern England*, A. FLETCHER, J. STEVENSON eds., Cambridge 1985 (Cambridge University Press), pp. 166-195; H.C. DARBY, *The Draining of the Fens*, Cambridge 1956 (Cambridge University Press); E. ASH, *The Draining of the Fens*, Baltimore, 2017 (Johns Hopkins University Press).

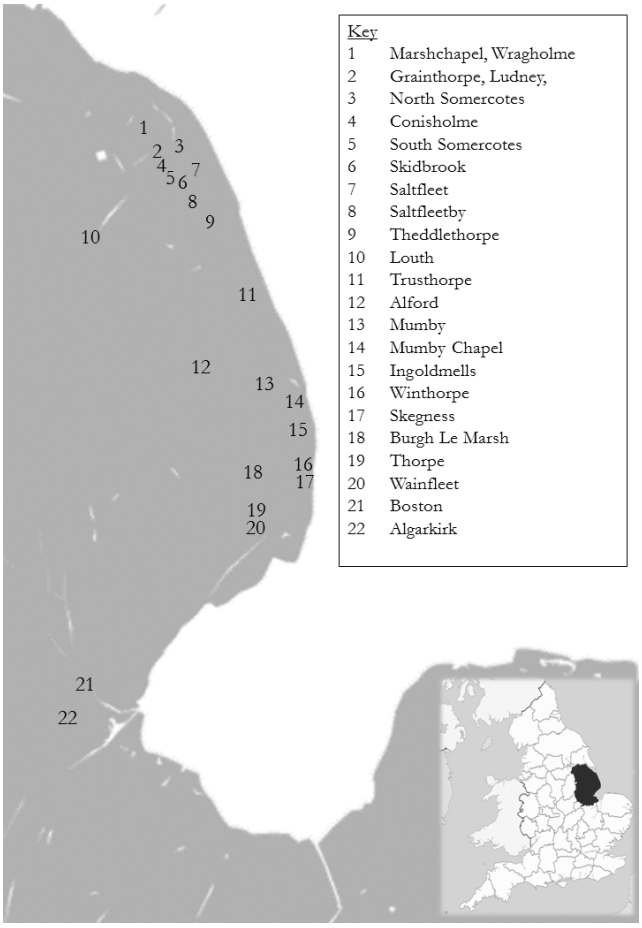
[4] M.L. ALLEMEYER, *"Kein Land ohne Deich...!": Lebenswelten einer Küstengesellschaft in der Frühen Neuzeit : mit 13 farbigen Abbildungen*, Göttingen 2006 (Vandenhoeck & Ruprecht); F. MAUELSHAGEN, *Disaster and Political Culture in Germany since 1500* in *Natural Disasters, Cultural Repsonses: Case Studies toward a Global Environmental History*, C. MAUCH, C. PFISTER eds., Plymouth 2009 (Lexington Books) pp. 41-75, p. 52.

[5] P. VAN CRUYNINGEN, *Sharing the Cost of Dike Maintenance in the South-Western Netherlands: Comparing 'Calamitous Polders' in Three 'States', 1715-1795*, in "Environment and History", 23 2017, n. 3, pp. 363-383; T. SOENS and P. DE GRAEF, *Polder mania or marsh fever? Risk and risk management in early modern drainage projects: the case of Kallopolder, Flanders, 1649 to 1662*, in "Agricultural History Review", 62, 2014, n. 2, pp. 231-255.

[6] P.J.E.M. VAN DAM, P. VAN CRUYNINGEN, and M. VAN TIELHOF, *A Global comparison of Pre-Modern institutions for Water Management*, in "Environment and History", 23, 2017, n. 3, pp. 335-340.

management in a comparatively under-explored corner of what Greg Bankoff has termed the 'North Sea basin system' of shared risk.[7]

Map 1. **Principal places mentioned in the text**



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East Lincolnshire, the case study examined here, is an interesting area in which to explore such issues. The study area lies on England's east coast, between the Wash and the Humber Estuary (map 1). The section of coastal marshland on which this paper is focussed stretches from Donna Nook in the north, southwards around

[7] G. BANKOFF, *The 'English lowlands' and the North Sea basin system: a history of shared risk*, in "Environment and History", 19, 2013, n. 1, pp. 3-37.

Gibraltar Point, and on to the north side of the Wash. This land lies between the Lincolnshire Wolds, an elevated area of chalk, limestone, sandstone and clay running parallel to the coast, and the North Sea. The land east of the Wolds has traditionally been divided into three marshland areas, the Inner, Middle and Outer Marshes.[8] The Commissions of Sewers under study here were primarily concerned with the Middle and Outer Marshes. The Middle Marsh lies at the foot of the Wolds, declining eastward towards the Outer Marshes. The Middle Marsh is formed of marine and freshwater alluvium, lying on Tertiary-period glacial deposits and Upper Cretacean chalk. The Outer Marshes themselves have been largely formed since the Roman period, reclaimed incrementally from the sea to provide saltmarsh for grazing, and, where sufficiently drained, land for arable farming. Settlement in the area is divided between the nucleated villages of the Middle Marsh and the more dispersed pattern of the Outer Marsh, where permanent habitation was established on the waste mounds of the medieval salt industry.[9] These were thus comparatively new settlements in our period, still occasionally visited by transgressions of fresh and salt water. Two of the more significant towns, Saltfleet and Wainfleet had havens for shipping, and whilst Skegness too once had its own haven, this was in decay by the second third of the sixteenth century when John Leland found parts of the old town "clean consumed, and eaten up with the sea" and the haven but a memory.[10]

The Commissions of Sewers with which this paper is concerned managed flood defence, drainage and navigation on a local and regional scale in early modern England. They are an example of what historians Beatrice and Sidney Webb referred to as 'statutory authorities for specific purposes', having authority over water management only, in a similar manner to other locally-operational bodies that maintained infrastructure and aspects of local landscapes, like Turnpike Trusts (concerned with principal roads) and Paving and Lighting Commissions.[11] The powers of Commissions of Sewers were enshrined in the 1532 "General Act Concerning Commissions of Sewers", yet they derived their authority directly from the monarch, who granted Commissions.[12] To aid the effective maintenance of flood defences and preservation of navigable waterways, the directions Commissioners gave carried legal authority within their jurisdiction. Alongside these powers to effectively make local laws, Commissions were granted rights to

[8] For a useful and brief introduction to landscape of the study area, on which the following description is based, see J. BUGLASS, T. BRIGHAM, *Rapid Coastal Zone Assessment, Yorkshire and Lincolnshire: Donna Nook to Gibraltar Point*, Hull 2008 (Humber Field Archaeology and English Heritage).

[9] A.E.B. OWEN, *Salt, Sea-Banks and Medieval Settlement on the Lindsey Coast*, in *A Prospect of Lincolnshire*, ed. N. FIELD, A. WHITE eds., Lincoln 1984 (Field and White), pp. 46-49.

[10] *The itinerary of John Leland in or about the years 1535-1543*, I-V, ed. L. TOULMIN SMITH, London 1909 (George Bell and Sons), IV, p. 181.

[11] B. WEBB, S. WEBB , *English Local Government: Statutory Authorities for Special Purposes*, London 1922 (Longmans, Green and Co.).

[12] 23 Hen. VIII, c. 5: *A general Act concerning Commissions of Sewers to be directed in all parts within this Realm*, in *The Statutes of the Realm*, I-XI, ed. J. RAITHBY, London 1810-1828 (Record Commission), III, pp. 368-372.

levy rates on landholdings, the ability to enforce service obligations, and rights to issue fines and confiscate goods. The origins of the powers set out in the 1532 statute are found in the mid thirteenth century, when senior judge Henry de Bathe was commissioned to settle disputes over drainage and flood defence responsibilities that had arisen between the inhabitants of Romney Marsh. Henry was to arbitrate between a group of jurors, who represented an administrative structure of a much older lineage.[13] These local administrative structures – what would become known as the 'customs of Romney Marsh' – were given statutory authority in the fourteenth and fifteenth centuries, culminating in the 1532 Statute of Sewers. Commissions of Sewers remained remarkably resilient over the centuries, only beginning to fall from favour in the mid-eighteenth century, and being finally removed from the administrative topography of lowland England in 1930 with the passage of the Land Drainage Act.

Commissions of Sewers share common features with a variety of other North Sea water management institutions.[14] Like the Flemish *wateringen*, they organised the construction of dikes and sluices and oversaw the maintenance of navigation. The *hoogheemraden* of Rijnland operated a similar system of courts from which they handed down judgements on drainage works, much like the Commissions of Sewers. While these Dutch courts evolved into more powerful, regional administrative rather than judicial institutions over the course of the sixteenth century, the Commissions of Sewers continued to operate a system of courts and judgements into the eighteenth. They also remained unsalaried and non-specialist, in the manner of much early modern English local government and the 'participatory society' on which it thrived.[15]

In Lincolnshire, much of the practical work that Commissioners of Sewers ordered and directed was undertaken by dikereeves. Dikereeves were elected local officials charged with the maintenance of drainage ditches, sea walls and sluices in their locality.[16] Whilst Commissions of Sewers proliferated nationwide, the specific office of the dikereeve appears to be a largely eastern phenomenon. References to the office of the dikereeve stretch back to at least the thirteenth century in eastern England. In his *History of Imbanking and Draining*, published in 1662, the historian and antiquary William Dugdale provides references to "Jurats, or Dike-reeves" as far back as 1288, with officers known solely as dikereeves appearing in the docu-

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13 H.G. RICHARDSON, *The Early History of Commissions of Sewers*, in "English Historical Review" 34, 1919, n. 135, pp. 385-393, 389.

14 For Commissions of Sewers in a European context, see J.E. MORGAN, *The Micro-Politics of Water Management in Early Modern England: Regulation and Representation in Commissions of Sewers*, in "Environment and History", 23, (2017), n. 3, pp. 410-430, 413-414 and the references therein.

15 J. PITMAN, *Tradition and exclusion: parochial officeholding in early modern England: a case study from North Norfolk*, in "Rural History", 15, 2004, n. 1, pp. 27-45.

16 The general statements in this paragraph are observations made on dikereeves' accounts from the sixteenth to the nineteenth centuries in Lincolnshire Archives. LINCOLNSHIRE ARCHIVES, *Spalding Sewers*, 490, 1-4 Accounts, and LINCOLNSHIRE ARCHIVES Alford Sewers, Dikereeves' Accounts, Candleshoe, 1-5.

ments from the early fourteenth century.[17] We find references to dikereeves in Cambridgeshire, Lincolnshire, Kent, Middlesex, Norfolk and the Isle of Ely.[18] This may well reflect the influence of other North Sea water management cultures in eastern England, there being locally-responsible officers called 'Deichgrafen' in North Germany, and more senior water management officials called 'dijkgraven' in the Netherlands.[19] The nineteenth-century historian of drainage, W.H. Wheeler noted that dikereeves proliferated in the silt fens of south Lincolnshire following the large-scale drainage enterprises of Dutch engineers in the seventeenth century.[20] These commonalities among northern European institutions for flood risk management are indicative of a 'North Sea basin system' in which both risk and cultures of risk management were common across national boundaries.[21]

In the east, the dikereeve's jurisdiction was largely coterminous with that of the parish, and thus we find a number of parochial dikereeves' accounts filed alongside those of overseers, churchwardens and constables. This seems to have been particularly prevalent in lowland South Lincolnshire, in fen and fen-edge parishes, where dikereeves' accounts can be found interleaved with other parochial officials in "town books" and vestry books.[22] Social historians of early modern England have identified the sixteenth century as a defining period in the development of the parish as an administrative unit. Originally ecclesiastical units, parishes gained a number of secular, local government functions across this period, becoming responsible for routine administrative tasks like welfare provision and highway maintenance.[23] With the rise of the parochial dikereeve, we can add another environmental function to their growing list of responsibilities that by the mid-sixteenth century had evolved to include other tasks in the landscape, such as pest control.[24]

Further north, in the coastal areas to the south and east of the Lincolnshire Wolds, dikereeves were more closely integrated with and overseen by the various Commissions of Sewers that operated there. Dikereeves here were organised by commission, deanery and then parish. However, given the extensive and ongoing modification of the drainage system east of the Wolds in this period, dikereeves were also appointed for sub- and intra-parochial areas, given the lie of particular

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[17] W. DUGDALE, *The history of imbanking and drayning of divers fenns and marshes, both in forein parts and in this kingdom, and of the improvements thereby extracted from records, manuscripts, and other authentick testimonies*, London 1662 (Alice Warren), p. 37, p. 362.

[18] *Ibid*, passim.

[19] M.L. ALLEMEYER, *"Kein Land ohne Deich...!": Lebenswelten einer Küstengesellschaft in der Frühen Neuzeit : mit 13 farbigen Abbildungen*, Göttingen 2006 (Vandenhoeck & Ruprecht), pp. 74-75; S. CIRIACONO, *Building on Water: Venice, Holland and the Construction of the European Landscape in Early Modern Times*, trans. J. SCOTT, Oxford 2006 (Berghahn), p. viii.

[20] W.H. WHEELER, *A History of the Fens*, Boston 1897 (Newcomb), appendix IV, p. 5.

[21] G. BANKOFF, *The 'English lowlands'*, cit.

[22] i.e. LINCOLNSHIRE ARCHIVES Cowbit Parish, 10, 2, 2, Vestry account book 1685-1771.

[23] B. KÜMIN, *The Shaping of a Community: The Rise and Reformation of the English Parish, c.1400-1560*, Aldershot 1996 (Ashgate); S. HINDLE, *The state and social change in early modern England, c. 1550-1640*, London 2000 (Palgrave).

[24] R. LOVEGROVE, *Silent Fields: The Long Decline of a Nation's Wildlife*, Oxford 2009 (Oxford University Press).

drainage routes. For example, the parish of Winthorpe had two sets of dikereeves, those for Winthorpe North End and those for Winthorpe South Common together with the north end of neighbouring Burgh Le Marsh, and the parishes of Wainfleet and Thorpe St Peter shared a common set of dikereeves charged with the maintenance of their communal drainage windmills. These last examples – of administrative units self consciously aligning to more environmentally sensitive boundaries – bring to mind Charles Phythian-Adams' observation that "different broad patterns of drainage have always tended to provide the most influential matrices for the creation of human territories".[25] We can observe this with the redistricting of Lincolnshire dikereeves in the sixteenth and seventeenth centuries – straying beyond and across parish boundaries in order to take in a jurisdiction that was more closely aligned with current drainage needs than previous administrative ones.

The method of electing Lincolnshire dikereeves remains unclear, but it can be assumed that they, like other parish officials in the period, were chosen from amongst the wealthier male members of local communities to serve for one year, before the role was passed to someone else.[26] In Romney Marsh, dikereeves were selected by Lords of the Fees, and by a majority of the commoners of marsh.[27] In Wiggenhall, in west Norfolk, dikereeves were sworn into their office on the common consent of the "whole commonality" of the town to ensure that whoever served both had sufficient lands and tenements within Wiggenhall to spur them into action, as well as knowledge of the customs of Marshland.[28] Dikereeves in Lincolnshire usually operated in pairs, and were required to collect a "rate" – a contribution from landholders within their jurisdiction based on a universally applied number of pence per acre. The level of this rate would be set by Commissioners of Sewers. Dikereeves' accounts thus nearly always begin with a statement of costs incurred in obtaining their "law" – official confirmation of their eligibility to collect the rate. Dikereeves would then use the funds gathered in the fulfilment of their duties, which included liaising with the Commissioners, participating in Commission business, procuring workmen, materials and equipment for repairs, supervising routine drainage, inspecting sea defences, recording their work and having their expenses audited. They were answerable to both their parish and to the Commissioners of Sewers, with their accounts audited both locally and in the court of sewers.[29] Their accounts are thus a record of money spent in the business of communal flood defence, including both practical and institutional costs.

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[25] C. PHYTHIAN-ADAMS, *An Agenda for English Local History*, in *Societies, Cultures and Kinship, 1580-1850: Cultural Provinces and English Local History*, ed. C. PHYTHIAN ADAMS, Leicester 1993 (Leicester University Press), pp. 1-23.

[26] J. KENT, *The Centre and the Localities: State Formation and Parish Government in England, Circa 1640-1740*, in "The Historical Journal", 38, 1995, n. 2, pp. 363-404, 378.

[27] W. DUGDALE, *History of Imbanking*, p. 37.

[28] *Ibid*, p. 293.

[29] i.e. the parish of Marshchapel audited its dikereeves' accounts, recording their work in the parish register. See LA Marshchapel Parish 1, 1 MF 12 28 001 02A, p. 70, p. 73, p. 74.

The surviving accounts on which this paper is based make up a relatively small sample of what dikereeves originally produced. The 260 complete accounts of the Alford Sewers dikereeves produced in the years 1570-1700 and used here come from fourteen coastal parishes and townships, and represent just under fourteen percent of those produced across this area in the period.[30] Record survival is uneven across the region: the parish of Theddlethorpe yields just six usable dikereeves' accounts, whereas the sub-parochial division of Winthorpe South Common yields a respectable thirty-two. In national perspective, Lincolnshire's water management archives are relatively abundant for the period before 1700, in contrast to other counties, like Somerset, where water management was equally crucial in daily life, but records have been lost almost entirely for the period before the later eighteenth century.[31]

Despite their survival, many of the records are in a poor state. They have been rarely examined by historians since Lincolnshire historian and Cambridge University Librarian, Arthur Owen, produced a number of short articles, and one partial set of transcriptions as part of his research into east Lincolnshire in the second half of the twentieth century. Since this time a significant number of record classes have been deemed unfit for production by archivists and require urgent restoration, including some classes used by Owen in the 1950s. Much like the coastline they describe, these records have been, and continue to be, threatened by the ravages of time. They had languished for over a century in an office above the porch of St. James' church in Louth, before being moved to Alford in the mid-eighteenth century. In the mid-twentieth century, they were deposited with the Lincolnshire Archives Office by Arthur Owen's father.[32] The catalogue produced at that time and amended ever since is a mixture of mid-twentieth century typescript, pen and pencil, indicating the fortunes of the contents, which appear to have been borrowed, returned, "reduced", and lost at various points over the last seventy years.

The accounts themselves are a mixture of working and "fair" copies. The majority are the working documents produced by dikereeves as they went about their work. Thus, they can be messy, repetitive and idiosyncratic. These records are also some of the richest sources for understanding how people managed their flood risk. Fair copies, produced by a clerk, compress much of the detail of the dikereeves' work, presenting only total spends on items like labour and materials. Working documents tell us the names of each individual labourer, sometimes their kinship ties to other labourers, as well as where materials were purchased from and how they were transported. Through these details, we can gain an intimate picture

[30] These dikereeves' accounts are in the class LA Alford Sewers, Dikereeves Accounts and are organised by wapentake then parish or township. Others used here, from the Commission of Sewers at Spalding, are under the class LA Spalding Sewers, 490-497

[31] M. WILLIAMS, *The Draining of the Somerset Levels*, Cambridge 1970 (Cambridge University Press), p. 82.

[32] A.E.B. OWEN, "*The Levy Book of the Sea": The Organization of the Lindsey Sea Defences in 1500*, in "Lincolnshire Architectural and Archaeological Society Reports and Papers", 9, 1961, n. 1, pp. 35-48, 35; IDEM, *The Upkeep of the Lindsey Sea Defences*, in "The Lincolnshire Historian", 2, 1963, pp. 23-30, 29.

of the construction and maintenance of flood defences in the period, as discussed in section two.

The first section focusses on how dikereeves organised and financed local flood defences in east Lincolnshire. It shows how closely these local water managers had to know their landscapes given the frequency of the interventions they had to make into their coastal and freshwater flood defences. Section two highlights some of the financial challenges faced by local water managers in times of flood, focussing on the importance of the role of individual dikereeves in providing flood defence. The overall contribution of this article is then to refocus our attention on local administration and the crucial role it played in determining levels of flooding in early modern east England. It shows that experience of flood disasters was significantly shaped by the performance of local institutions charged with flood defence, institutions which varied year-on-year and parish-by-parish due to their decentralised and discretionary character.

ORGANISING FLOOD DEFENCE

The multiple kinds of flood risk present in the marshland – from the sea, rivers, rainfall, meltwater and human behaviour – meant dikereeves were constantly performing a delicate balancing act that became particularly difficult in adverse weather conditions. Several dikereeves' accounts record payments for breaking ice and shifting snow to either ease or prevent flooding, as at Mumby Chapel in 1688, North Somercotes in 1614, 1669, and 1711, Saltfleetby in 1708, and Trusthorpe in 1635. The dikereeves at Mumby Chapel paid men to remove pieces of a broken ship from their gowts in 1652.[33] In 1664 Mumby's dikereeves cut down banks to move flood waters around their drainage network, and in the early eighteenth century dikereeves at South Somercotes used meadows to store water during floods, later cutting banks to release it.[34] Dikereeves could be paid by neighbouring parishes to undertake "runs", involving opening sluices, cutting banks and making temporary new ones in order to facilitate the one-off movement of water.[35] "Runs" could involve the significant displacement of regular waterways. Further south at Tidd St. Mary in 1613, dikereeves hastily constructed temporary new routes across the parish using portable bridges borrowed from parishioners as they diverted water from one area to another during one of their "runs".[36]

Such flurries of activity remind us that while the landscape was not punctuated with windmills and pumps, as much of the southern Lincolnshire marshland would come to be in the eighteenth and nineteenth century, it was no less dynamic. The infrastructure dikereeves were employed to construct and service appears less like a

[33] LA Alford Sewers Dikereeves' Accounts, Calceworth, 10 Mumby Chapel, 18 1652 Accounts.

[34] LA Alford Sewers Dikereeves' Accounts, Louthesk and Ludborough, 12 North and South Somercotes, 44 and 48, Accounts for 1709 and 1711.

[35] i.e. Trusthorpe received such money from Sutton in 1689. LA Alford Sewers Dikereeves' Accounts, Calceworth, 15 Trusthorpe, 22 1689 Accounts.

[36] LA Spalding Sewers, 490, 4, 33v, Tidd St Mary's 1613

structure, and more like a set of routines. The landscape then emerges from this picture as a kind of watery "taskscape" in the manner described by Tim Ingold.[37]

The nature of work varied along the coastline. In the area around Somercotes and Donna Nook, sediment circulates in the outer-reaches of the Humber Estuary system. However, further south the coastline is characterised by longshore drift, which, amongst other effects, feeds the dune system at Gibraltar Point.[38] At Mumby Chapel and Trusthorpe these drifting sands caused recurrent problems for dikereeves seeking to manage the freshwater in their marshes, where men were repeatedly paid to shift sand out of the gowts.[39] Construction work was dictated by the seasons and the tides. The principal working season was summer, in the calmer months between May and mid-June when the majority of major renovations were scheduled and labour was most readily available.[40] Construction work could be continued in the winter months, usually during October and November, when shorter days were reflected in a reduced daily rate of five pence. Monthly working patterns were influenced by regular tidal patterns. Occasionally dikereeves recorded workers' efforts in tides rather than days, as at Winthorpe North End in 1692.[41] Should dikereeves fail to pay close enough attention to tidal patterns, their work could be disrupted. Dikereeves had to pay labourers to search along the coastline for wood "driven about the marshes with the tide" at Saltfleetby in 1610 and at Mumby Chapel in 1652.[42]

Defences were maintained with recourse to a variety of materials. Gotes, or "gowts", the large pipes with sluice gates that ran through sea walls, would be patched up with tar and hair brought to the site in sacks and pots.[43] Sea walls were planted with hedges and brushwood to help trap blown sand and aid dune formation. Wood was the most important yet least abundant material. East Lincolnshire was a largely treeless landscape. The only trees of significance were those submerged by the North Sea, and intermittently revealed to curious naturalists off the Lindsey coast in the late eighteenth century.[44] Timber had to be obtained from the wooded areas of the Wolds to the west, or more commonly by water from either the port at Boston, or north of the Humber in the East Riding of Yorkshire. Dikereeves record payments to men sent to Nun Appleton and Selby,

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[37] T. INGOLD, *The temporality of the landscape*, in "World Archaeology", 25, 1993, n. 2, pp. 152-174.

[38] J. BUGLASS, T. BRIGHAM, *Rapid Coastal Zone Assessment*, cit., p. 15.

[39] LA Alford Sewers Dikereeves' Accounts, Calceworth, 10 Mumby Chapel, 16 1650 Accounts; LA Alford Sewers Dikereeves' Accounts, Calceworth, 14 Trusthorpe, 22 1689 Accounts.

[40] A.E.B. OWEN, *The Upkeep of the Lindsey Sea Defences*, p. 25.

[41] LA Alford Sewers Dikereeves' Accounts, Candleshoe, 13 Winthorpe North End, 29 1689 Accounts. Similar practices can be seen in Gloucestershire: Gloucestershire Archives D866, E7, Labour accounts and memoranda… notes on work done on the sea walls at Oldbury-on-Severn 1730.

[42] LA Alford Sewers Dikereeves' Accounts, Louthesk and Ludborough, 10 Saltfleetby and Saltfleet Haven, 27 1610 Accounts.

[43] LA Alford Sewers Dikereeves' Accounts, Louthesk and Ludborough, 10 Saltfleetby and Saltfleet Haven, 3 1570 Accounts, fol. 1.

[44] J. CORREA DE SERRA, *On a submarine Forest, on the east Coast of England*, in "Philosophical Transactions of the Royal Society of London", 89, 1799, pp. 145-156; D.N. ROBINSON, *The Book of the Lincolnshire Seaside*, Buckingham 1981 (Baron), p. 13.

on the rivers Wharfe and Ouse, where wood could be purchased and transported by river to the Lincolnshire coast, avoiding prohibitively expensive overland transportation costs.[45]

Just as materials circulated within the marshland area, so did people. One of the dikereeve's roles was to obtain labourers, and in times of difficulty, to ride around local towns and villages seeking assistance. The dikereeves at Mumby Chapel did this in 1691 when they were paid to solicit labourers from the local area to work on the sea wall.[46] The largest construction projects utilised more labour than individual parishes or townships could supply. It is not then unusual to find labourers from across the marsh in any one parish working on flood defences.

As well as people, money moved across the marsh to support flood defence and drainage work. Milja van Tielhof has identified the importance of "scale mismatch" in water management in coastal regions – where the size or complexity of defence and drainage systems was too great to be sufficiently maintained by the levies made on the associated landholders.[47] In order to adequately protect such regions, the area assessed for contributions had to be scaled upwards, resulting in "forced solidarity" between neighbouring regions. Such arrangements can be observed in coastal east Lincolnshire. Commissioners of Sewers abided by a "Levy Book of the Sea & Towns in Great Danger", produced around 1500, and used until the eighteenth century.[48] This document was created for "defence against the rage of the sea, and the making of the sea walls", and listed eleven towns as either "in danger" or "in very great danger" of the sea. Forty-two additional towns were then listed as "levy towns", having no sea banks of their own, but in danger from the sea should the coastal banks fail. They were to contribute "from time to time as often as need shall require at the discretion of the Commissioners". This "levy book" represents one of the oldest examples of "forced solidarity" in East Lincolnshire, but is certainly not the only one. The townships of North and South Somercotes were grouped together with Wragholme, Canthorpe, Conisholme and Ludney due to the drainage of their marshes through a new gowt at Skidbrook in 1640.[49] Skidbrook dikereeves received money from their counterparts at Saltfleetby for a gowt in 1711 seemingly voluntarily.[50] None of these places is featured in the levy book, but appear to have been grouped together to provide the same sort of ad hoc, irregular but formalised assistance as townships further south.

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[45] LA Alford Sewers Dikereeves' Accounts, Louthesk and Ludborough, 12 North and South Somercotes, 20 1640 Accounts.

[46] LA Alford Sewers Dikereeves' Accounts, Calceworth, 10 Mumby Chapel, 33 1691 Accounts.

[47] M. VAN TIELHOF, *Forced Solidarity: Maintenance of Coastal Defences Along the North Sea Coast in the Early Modern Period*, in "Environment and History", 21, 2015, pp. 319-35.

[48] LA Alford Sewers, 23 Miscellaneous Documents, 9 The Levy Book of the Sea, c.1500; OWEN, "*The Levy Book of the Sea*".

[49] LA Alford Sewers Dikereeves' Accounts, Louthesk and Ludborough, 12 North and South Somercotes, 20 1640 Accounts.

[50] LA Alford Sewers Dikereeves' Accounts, Louthesk and Ludborough, 10 Saltfleetby and Saltfleet Haven, 48 1711 Accounts.

These examples point towards a communal, or associational imperative in flood-prone coastal areas.[51] Robert van der Noort has urged historians and archaeologists to consider the role of the sea in creating social identities, particularly on the North Sea coast, where the construction of monuments, terpen and dikes has taken place through an entanglement of people and sea.[52] The administrative arrangements that built up around the construction and maintenance of coastal infrastructure codified a variety of social and economic interdependencies in coastal East Lincolnshire. Dikereeves, divided up into parochial, intra-parochial and sub-parochial units, utilised networks across the coastal region that provisioned them with finance, labour and materials. Within local administrative units, coastal inhabitants were bound together by their obligation to pay rates and elect officials. Across these units, people were socialised into a broader coastal community due to the levy towns system, labour mobility and the exchange of materials.

FINANCIAL CHALLENGES OF FLOOD DEFENCE

The variety of work undertaken resulted in sharply fluctuating annual costs. Yearly spends ranged from nearly 50d per acre in Skegness in 1571 to just under 1d per acre in North Somercotes in 1603. These costs reflected the scale of the works undertaken. Skegness was the site of a large construction effort in the period 1568-71, as the Commission of Sewers orchestrated the rebuilding of the town's sea wall, in response to, and during the stormy period 1566-71. The low spend at North Somercotes represents the costs of routine maintenance only. Dikereeves could discharge their office with a minimum of activity in calmer years, limiting their work to surveying and weeding ditches and drains.

The largest works cost hundreds of pounds and came after significant episodes of flooding. Mumby Chapel, a coastal satellite village of the parish of Mumby, remained in a precarious position across the period. The storms of 1570 caused significant damage at Mumby Chapel, coming in the midst of a multi-year construction project. Work commenced in 1569, only to be partially scuppered during the inundation of 5 October 1570.[53] Contemporary accounts record that the village lost three houses and the greater part of its chapel in the storms that year which also affected much of the North Sea coast.[54] Once work was finally completed 844l had been spent in four years – a significant sum for Mumby Chapel and its levy towns to be burdened with in the wake of damaging flooding. The area

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[51] J. MORGAN, *Flooding in early modern England: Cultures of coping in Gloucestershire and Lincolnshire*, Coventry 2015 (PhD thesis, University of Warwick), pp. 74-87.

[52] R. VAN DER NOORT, *North Sea Archaeologies: A Maritime Biography, 10,000 BC to AD 1500*, Oxford 2011 (Oxford University Press), p. 124.

[53] A.E.B. OWEN, *Chapel St. Leonard and the Flood of 5 October 1570*, in *Lincolnshire people and places: essays in memory of Terence R. Leach (1937-1994)*, ed. C. STURMAN, Lincoln 1996 (Society for Lincolnshire History and Archaeology), pp. 87-90.

[54] T. KNELL, *A declaration of such tempestuous, and outrageous floods, as hath been in diverse places of England. 1570*, London 1571 (William How for John Allde and William Pickering), sig. B4v-C1r; A. DE KRAKER, *Storminess in the Low Countries, 1390-1725*, in "Environment and History", 19, 2013, pp. 149-171.

remained vulnerable throughout the seventeenth century, and was the site of a number of construction projects at considerable expense, again after large floods. Works costing nearly 420l were undertaken at Mumby Chapel in 1652. The 1652 construction was likely in response to flooding in March the previous year; storm tides affected much of the North Sea region, resulting in the St Peter's Floods in the Netherlands and well-documented flooding on the East Coast of England.[55] Costs for the 1652 construction and others like it were spread over a wide area as a result of the levy towns system, which could yield considerable sums in times of extreme need. Prolonged periods of heavy rainfall throughout 1682 and 1683 led to flooding across Eastern England.[56] The reconstruction of sea defences and parts of the drainage network in 1683 cost nearly 1,000l, levied unevenly as 6s per acre for frontagers, and 1s 6d for levy towns, taking in a rate for over 7,700 acres. Such works demonstrate that financing flood security in east Lincolnshire rested on the shoulders of those affected. Other than the distinction between frontagers and levy downs, rates were collected equally on all acres, regardless of the quality or productivity of the land.

Fluctuating flood defence expenditure cannot be directly correlated with flood disasters both because of the nature of the surviving documentation, as well as the compound nature of the flood risk that dikereeves managed. The variables involved in the amount of money spent are not solely determined by fluctuations in weather conditions, they are driven by the current state of flood defences and drains, local willingness to raise taxation, responsiveness of individual dikereeves, changing weather inland and on the coast, and more. Runs of consecutive accounts that coincide with floods are infrequent, and a full chronology of flood events is only just starting to emerge from the historical record; thus the conclusions offered here are necessarily provisional and imprecise. However, by averaging decadal spends and comparing them with the number of currently known floods in a given decade, some relationships can be inferred.

The difficulty of the situation on the most exposed parts of the coast is reflected in Map 2, which shows the relationship between flood defence expenditure and floods per decade along the Lincolnshire coast. The circular markers represent dikereeves who spent more than average in more flood-prone decades, the square markers represent dikereeves whose expenditure shows no clear trend of deviation from average spends in flood prone decades, and the triangular markers represent dikereeves who spent less than average in more flood-prone decades. The clustering of negative correlations in the most exposed parts of the coast suggests that floods here did not spur investment in flood defences. This

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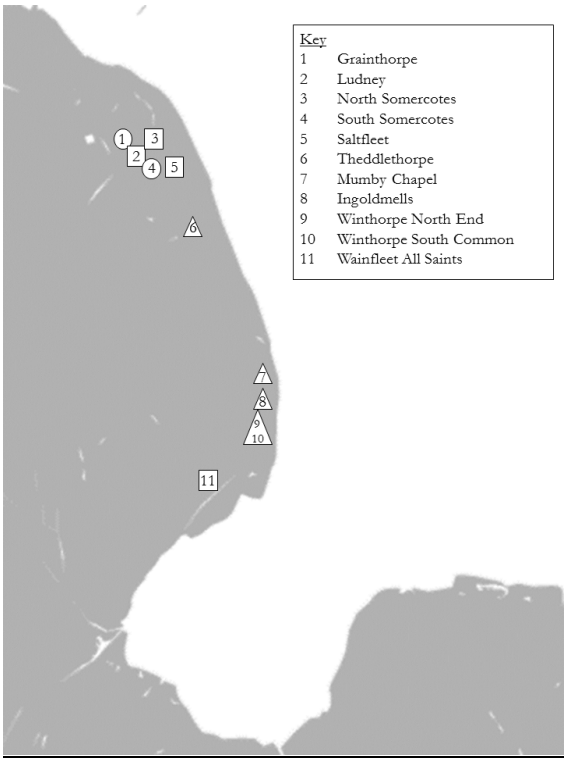
55 ANON., *Strange and terrible news, from Holland, and Yarmouth. Being, a perfect relation, concerning the inundation of the south sea; and of its drowning the rich and populous city of Amsterdam; with divers other places in Friesland, Holland, Brabant, and Flanders, and the names of them.* London, 1651 (Robert Wood); ANON., *A true relation of the great and terrible inundation of waters, and over-flowering of the lower-town of Deptford, on Thursday last, about two of the clock in the afternoon*, London 1651 (George Horton).

56 ANON., *England's most Dreadful Calamity By the Late Floods: Being a most Lamentable Account of the Great Damages sustained by the fearful Inundations*, London, 1682 (P. Brooksby); ANON., *A True Relation of the many sad and Lamentable Accidents that have Happened by the fearful-floods Occasioned By the Late unusual rains in several Countries of England*, London 1683 (E. Mallet).

is the section of coastline identified as "in great danger" by Commissioners in the "levy book".[57] In this region, the most flood-prone decades typically saw lower than average investment in flood defences, as opposed to regions further north and south. Joan Thirsk argued that the economic and demographic decline that characterised east Lincolnshire in the seventeenth century was attributable to flooding. For Thirsk, recurrent flood disasters were the push factors of migration from coastal villages to inland areas, which themselves saw a concomitant rise in population and prosperity.[58] In contrast, Arthur Owen suggested that decline in coastal areas did not come from extraordinary moments of flooding, but rather the continued costs of maintaining sea defences.[59] Whether it was the burden of flood defence expenditure or the impact of floods themselves that was causing economic decline in east Lincolnshire, we can see that little attempt was made to slow this decline through increased protection from flooding.

Map 2. **Flood defence expenditure and floods per decade]**



[57] LA Alford Sewers, 23 Miscellaneous Documents, 9 The Levy Book of the Sea, c.1500.

[58] J. THIRSK, *English Peasant Farming: The Agrarian History of Lincolnshire from Tudor to Recent Times*, London 1957 (Routledge, Kegan and Paul), p. 146.

[59] A.E.B. OWEN, *The Upkeep of the Lindsey Sea Defences*, p. 29.

To the south, the coastline of Wainfleet All Saints extended to Gibraltar Point, which was accreting in this period. No fluctuation in flood defence expenditure in times of flood is observed here. Further north, beyond the dunes at Theddlethorpe, a cluster of dikereeves display a mixture of neutral and positive correlations. Land at what is now known as Donna Nook was being reclaimed in the 1630s. In more flood-prone decades here, dikereeves were more likely to spend more on flood defences, mirroring the greater level of investment in the northern part of the region.

The data are not complete enough to infer any strong causation between flooding and funding. Soens has shown that lack of investment in flood defences led to entitlement failures in flood defence provision, leading to a higher incidence of flood disasters in periods of low investment.[60] Unfortunately, the weakness of the data means such a relationship cannot be observed here. We can make the rather insubstantial inference that periods of flooding did not lead to increased expenditure on flood defences in the central area around Ingoldmells. Given the decline noted by Thirsk in this central region, we can hypothesise that the regional pictures of investment in the north and a lack of it around Ingoldmells indicate that the local provisioning of flood defence could lock areas into patterns of decline. Whether or not flooding drove initial decline, the failure or inability to properly invest in defences in the years after floods is indicative of a vicious cycle of decline, flooding and underinvestment, where after episodes of flooding repairs were funded poorly.

More substantial insights can be gained from looking at how dikereeves obtained their funds. By taking our understanding of flood defence expenditure from the most local sources possible, we can observe some of the financial arrangements unrecorded higher up in the decision-making process. Whilst the order books of Commissioners of Sewers provide a convenient indication of the total amount of money to be levied in a particular region at a particular time, these figures can conceal as much as they reveal. Commissioners issued "landlaws" which permitted dikereeves to collect a tax at a set rate, and were essential to the financing of local flood defence maintenance. They should not however be taken as records of actual expenditure, given the significant degree of local autonomy exercised on the ground.

Parishes and townships exercised a significant degree of latitude over their financial arrangements. Semi-formal financial arrangements are recorded in the dikereeves' accounts. Sometimes these are to allow for dikereeves' overspends. In South Somercotes in 1620/1, Thomas Hardie, dikereeve, overspent on a variety of activities that went beyond his mandated duties, including rebuilding sluices, raising banks and scouring drains. Townsmen were happy however to sign off on these activities, subscribing to a declaration that had Hardie not exceeded his office, Skidbrook and Somercotes would have "suffered and sustained much harm by salt

[60] T. SOENS, *Flood Security in the Medieval and Early Modern North Sea Area: A Question of Entitlement?*, in "Environment and History", 19, 2013, pp. 209-232; T. SOENS, *Floods and money: funding drainage and flood control in coastal Flanders from the thirteenth to the sixteenth centuries*, in "Continuity and Change", 26, 2011, n. 3, pp. 333-365.

water this winter".[61] At Winthorpe, the townsmen agreed to forgo the rate of 49 acres that once drained through their dikereeve's jurisdiction, because "it now drains by the south common".[62] Elsewhere, dikereeves were happy to raise revenues outside of their allotted taxes. In the fenland parish of Algarkirk, 10km southwest of Boston, the inhabitants noted that whereas the Commissioners of Sewers had proposed a rate on their lands, they "thought it not convenient to gather it at all" because of an outstanding debt due to the town from a previous dikereeve.[63] Situations such as this were common. Communities sought to minimize their financial contribution towards their flood defences through several informal revenue streams, such as pursuing historic debts from dikereeves.

Individual dikereeves sought to reduce the amount they had to personally advance in the service of their community by selling materials left over from completed works. Dikereeves frequently sold nails, timber and boards purchased for the repair of gowts and sluices.[64] Such commodities were attractive to buyers in a relatively treeless region, particularly as dikereeves sold them at cost price, failing to pass on the costs of transporting the materials either from the uplands of the Wolds or up the coast from Boston. Through this practice, individual dikereeves saved themselves small amounts of money over a year's service, yet ended up costing their communities more in transportation costs in the long run.

The small benefits dikereeves could accrue from selling materials were often utterly eclipsed by the contributions they ended up making themselves. Evidence from elsewhere on the English North Sea coast points to the breakdown of flood defence arrangements when the semi-formal expectation that Sewers officials would self-fund works was not met. Coastal flooding in the early seventeenth century destroyed housing in Margate, Kent. The townspeople sued for a Commission of Sewers, and took decisive remedial action, creating and maintaining sea defences at a cost of 2,000l over twenty-five years. Problems emerged in 1642 when the incumbent Expenditor of Works (a role analogous to that of the dikereeve in Lincolnshire), James Smith, was unable to levy the scot, as "some particular men moved the commissioners to have the scot given over, and that every man might defend himself against the sea".[65] Chief among these were those whose houses and lands lay "more backward from the Sea, and in less danger".[66] Refusing to pay for sea defences led to both financial and material ruin for Smith. He was forced to borrow 200l and spend a further 480l to protect the town. Even

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[61] LA Alford Sewers Dikereeves' Accounts, Louthesk and Ludborough, 12 North and South Somercotes, 14 1621 Accounts.

[62] LA Alford Sewers Dikereeves' Accounts, Candleshoe, 14 Winthorpe South Common and Burgh North End, 6 1650 Accounts.

[63] LA Spalding Sewers, 490, 4, 23 Algarkirk Dikereeves' Accounts, 1613.

[64] LA Alford Sewers Dikereeves' Accounts, Louthesk and Ludborough, 10 Saltfleetby and Saltfleet Haven, 27 1610 Accounts.

[65] J. SMITH, *To the Honourable House of Commons, now assembled in Parliament the humble remonstrance of Iohn Smith, in behalf of the inhabitants of Margate*, London 1646, p. 2

[66] IDEM, *To the right Honourable the Lords and Commons now assembled in Parliament the humble petition of John Smith of Sandwich Draper, in behalfe of himself and the inhabitants of Margate*, London 1647, p. 1.

this was insufficient to stop the destruction of 4,000l of property and over thirty years' worth of sea defence construction.[67]

In Lincolnshire, towns built up large debts to their dikereeves. During the construction of the new gowt at Skidbrook, George Hollowe dikereeve, advanced 200l of his own money so that work could continue through the winter of 1638 and 1639. His accounts record how this "saved much in the workmanship", and Hollowe was repaid the full amount just over a year later, along with eighteen pounds for providing the advance.[68] In the flood year of 1694, the dikereeves of Saltfleetby and Saltfleet Haven spent 169l 0s 10d, of which 74l 0s 10d came from their own pockets. Much of this additional money – more than 60l – was spent on labourers retained on night and day shifts monitoring sluices, and for their eventual repair and reconstruction when broken.[69] The dikereeves at Trusthorpe were left out of pocket in consecutive years. Where debts to former officials accrued, these would usually be settled in subsequent years through increased taxation. However, at Trusthorpe in the late 1680s and across the stormy 1690s, the parish built up considerable debts to their dikereeves over multiple years. Years of under-funding and using one year's rate to settle the debts of another culminated in a significant outlay for dikereeves in 1691, having to make a personal contribution of 46l.[70] These examples demonstrate how safety and security was reliant on individual dikereeves venturing their own funds, as much as it was on taxation and investment. Without a dikereeve with the will and ability to advance substantial sums of money, coastal parishes could find themselves exposed and in danger of flooding. The decentralised nature of dikereeves' work made their personal and financial capacities central in determining the quality of flood protection they provided their communities.

CONCLUSION

Studying the dikereeves' accounts of sixteenth and seventeenth-century East Lincolnshire leaves us with several conclusions. The marshland landscape emerges as a highly, but not always effectively managed coastal system. Coastal processes are often taken to operate over the *longue durée*, with the advancing or receding of the shoreline over a period of decades or centuries, helping us to understand forces that operate on timescales much longer than those relevant to human communities. Human timescales might appear relevant only in relation to long-term activities like settlement and reclamation, taking place over at least several years. However, dikereeves' accounts present a picture of coastal management and change occurring on a monthly, weekly, and daily basis. They show us the incremental, failed, and

[67] IDEM, *To the Honourable*, p. 8; IDEM, *To the right honourable*, p. 1.

[68] LA Alford Sewers Dikereeves' Accounts, Louthesk and Ludborough, 12 North and South Somercotes, 20 1640 Accounts.

[69] LA Alford Sewers Dikereeves' Accounts, Louthesk and Ludborough, 10 Saltfleetby and Saltfleet Haven, 43 1694 Accounts.

[70] LA Alford Sewers Dikereeves' Accounts, Calceworth, 14 Trusthorpe, 23 1691 Accounts.

temporary interventions and changes in the shoreline that together contribute to wider coastal changes.

These individual actions are important. For a social historian, they might amount to labours, schemes and projects that matter in and of themselves, actions to be rescued from the enormous condescension of geographic time. Yet even if we do think in more geographical registers about the past, these actions should still interest us. Dikereeves' accounts are testament to the ongoing effort required to manage floodplains and coastal environments. Just like the water against which it worked, drainage and flood defence infrastructure was not static. It required the constant attention of water managers whose experience and expertise – often non-technical – was a significant factor in shaping the experience of inhabiting coastal landscapes. The ongoing work of dikereeves not just maintaining old channels and creating new ones, but creating temporary ones, altering sluices during certain weather conditions, and making choices about where and when to drain and flood particular locales changes our perspective on infrastructure from something relatively static to what might be more accurately characterised as a dynamic part of a dynamic coastal system.

Amongst all this work, money was crucial in determining how effectively flood protection was provisioned. By levying taxation locally, Commissioners of Sewers placed the primary burden on those affected by flood disasters. Long-term construction costs were spread over a number of years, softening the financial blow to individual townships. However, this could prove imprudent, as work was often interrupted, set back or utterly scuppered by storms. Investment in flood defences was regionally planned, but locally directed. Attempts to mitigate the burden of the cost of flood defence worked reasonably well under the "levy towns" system. However, in flood years this could break down, as local initiative took precedence over regional planning. The duty to respond to difficult situations fell on the shoulders of individual dikereeves, who could find themselves hundreds of pounds out of pocket in particularly bad years. The willingness and ability of communities and individuals to invest in flood defences then emerge as significant determining factors in the availability of flood protection.

Commissions of Sewers and their dikereeves are then symptomatic of the localised, discretionary early modern state. Commissions of Sewers can in one sense be seen as drivers of state formation – they incorporate a rotating annual cast of administrators and labourers within the workings of a statutory institution, expanding the reach and 'palpability' of the state deeply into the most remote of coastal villages. Yet, a study of dikereeves also puts the state in its place. The expanding English state relied on and was limited by the resources of its communities (and within them the social and financial capital of their chief inhabitants). While the long-term use of a statutory body to organise local life may have been good for the growth of the state, reinforcing its presence in the localities over the long term, how useful this was for the flood-hit communities of east Lincolnshire is less clear. Facing down North Sea storms with only the few coins in the dikereeve's purse, the inhabitants of economically declining settlements in east Lincolnshire might have been forgiven for forgetting about the state altogether, at least in bad years. This eastern English system of parochially-organised dikereeves

was less effective at spreading the costs and risks of flood defence than other North Sea solutions, like the growing *hoogheemraadschappen* of the Netherlands. By devolving flood protection back to local communities and dikereeves the system of Commissions of Sewers in east Lincolnshire could end up mirroring rather than mitigating local vulnerabilities. Even with the presence of a standardized regional bureaucracy, operating within a national statutory framework, dikereeves and their marshland communities still reflect what Issac Land has called a 'continuum' of finely graded and stratified coastal experiences.[71] Thus, despite the presence of the state, local conditions and practices remained the most important factors in determining levels of flood protection.

The mathematician Benoît Mandelbrot once playfully demonstrated the various lengths of the coastline of Britain.[72] Because of the fractal nature of coastlines, the observed length depends on the intervals at which we measure: the more closely we look at our coasts, the longer they appear to be. The same principle might be applied to the relationship between people and the sea in coastal marshes. This paper has sought to understand that relationship on the scale of the individual dikereeve and their parish, and has sought to emphasise the importance of activity on the most local of scales. The intricate and consuming routine and extraordinary labours of handfuls of local people fundamentally shaped the experience of life on the east coast of England in the early modern period. The more closely we look at these individual actions the more complex the relationship between people and water seems.

[71] I. LAND, *Tidal Waves: The New Coastal History*, in "Journal of Social History", 40, 2007, n. 3, pp. 731-743, p. 740.

[72] B. MANDELBROT, *How Long Is the Coast of Britain? Statistical Self-Similarity and Fractional Dimension*, in "Science", 156, 1967, n. 3775, pp. 636-638.