

Water management and the economic environment in Eastern England, the Low Countries and China c. 960-1650: comparisons and consequences¹

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This article uses comparative history and a micro-environmental study to discuss the issues at stake in the relationships between water management and economic development in environments which have been subject to periodic flooding and in the transition from wetland to drained landscapes. It suggests that the introduction of successful water adaption strategies depended upon a range of social functions, and that communities on occasion had sound reasons for not proceeding with drainage. In addition, the article provides an academic resource for agencies which are currently seeking to respond to critical fresh-water supply issues. It does this by considering developments in present-day hotspots within the United Kingdom and in southern Africa in the light of the conclusions drawn from its case studies, including a substantial one focused upon north-eastern Cambridgeshire.

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Introduction

Pre-modern water management has generally been viewed as responsive in the sense that communities invested in programmes from the perspective of survival with little concern for economic progress. This article reconsiders pre-modern water adaption strategies in relation to the economic opportunities presented by excesses of fresh-water supply, and brings together comparative history and micro-history methodologies. Of course, it has long been recognised that the integration of water resources into the economies of communities results in forms of collective action which differ from those primarily associated with land, but which at the same time require a degree of integration between the two systems. Yet concerns with economic transformations have generally been focused upon land management, with the consequence that analysis of water management and the economy has suffered from neglect even though it enriches understanding of the emergence and development of feudalism and capitalism (Tys 2005; Hoppenbrouwers & Van Zanden 2001). For instance,

water management programmes were critical to two of the most dynamic pre-modern economies which were on the threshold of the industrious and industrial revolutions, namely Song China (960-1279) and the Low Countries during the Golden Age (c.1500-1700) (Kuhn 1987: 127-87; Davids & Noordegraaf 1993). In both cases flood defences in coastal areas and drained wetlands were integrated with irrigation channels and waterways to store and redirect fresh water for human and agricultural needs, and to provide improved water routes crucial for the lowering of transport costs in order to feed cities. Current studies on this theme depend upon an inter-disciplinary framework (Cook & Williamson 1999; Rippon, 1996, 1997 and 2000; Williams 1970), but comparative analyses have been rarely undertaken by single authors in order to take account of developments at the micro-environmental level.

This article suggests that analysis should be moved away from the apparently crucial roles played by single agents in the introduction of new water management strategies, whether that comprises the state, monastic institutions or the market, and instead emphasizes the role of negotiation between agencies in the establishment of acceptable economic and environmental strategies. In particular, it notes that the decision to drain wetlands was not only linked to available technology, but also depended upon the social and legal relationships between local landowners and communities. The first part of this article analyses general developments in China, primarily under the Song, and in the Low Countries, mainly during the Golden Age. The second section discusses Eastern England, focusing attention upon developments in the fenlands of north-east Cambridgeshire as a case study, while the third part considers the implications of pre-modern experiences for the implementation of water management programmes in the current age within the United Kingdom and in the developing world.

Water management in pre-modern China and the Low Countries

Since the 1950s studies of water control in pre-modern China have been directed towards three themes; namely (1) the ways in which collective local organisations ensured that communities in risk prone areas developed and prospered in dealing with the excesses of water supply; (2) the inter-relationship between hydraulic engineering and the power of the state; and (3) the role of water in economic development, notably in the formation of regional economic specialisation (Flessel 1974). These themes are linked individually and collectively with the making and remaking of the Chinese landscape. For instance, before the 7th century the central region of Jiagnan was a vast

floodplain rather than being the economic core of the region (Elvin 1994: 22 citing Shiba 1988: 185), and it was only in the 11th century, after several centuries of investment in hydraulic programmes, that local historical sources began to comment on the economic value of reservoirs and dykes in the Hangzhou area. Shiba views the transformation of the Chinese rural economy as a series of hydraulic adaptations which began at the alluvial fans at the feet of mountains before being extended in scale and technological level and into different landscapes. Migrants brought their technical expertise from over populated areas into the periphery, and sent back foodstuffs and raw materials, thereby sustaining rapid population growth under the Song and a shift from a 'pure agricultural society' to one that had many of the characteristics of an 'urbanized civilization' (Elvin 1994: 20 citing Shiba 1988: 174-9).

Hydraulisation and political institutional power were closely linked, but not in the manner of Wittfogel's oriental despotism thesis (Wittfogel 1955). Under the Song there were negotiations between the faction which wanted to strengthen the fiscal base of the state and to secure better military logistics through the construction of polders and waterways, and those advisers who sought to maintain the viability of private polders in the interests of wealthy landowners. Since, though, landowners often worked closely with the state, and depended upon the state's power through conscription to mobilize manpower these interactions cannot be portrayed as state versus locality, or progress over conservatism (Elvin 1994: 30-1). In general, though, it was the state under the Song which took the lead in the establishment of hydraulic programmes, while it was left to local associations dominated by the gentry to manage them, although it needs to be noted that the initiative for the creation of polders passed into private hands from the 13th century (Elvin 1994: 21 citing Shiba 1988: 41, 43, 88). Yet the state was capable of reasserting its authority when required. Towards the end of the Ming dynasty (1368-1435) the landowners who had previously been responsible for polder maintenance began to move into cities leading to a breakdown of local water management. From the late 16th century the state obliged tenant farmers who actually worked the land to carry out the maintenance, while the landowners provided food, with all of the obligations being dependent upon the actual acreages worked and owned. In general 'endless and expensive efforts to hold the logistics of the empire together through engineering' devoured capital and prevented the introduction of cheaper maritime transport (Elvin 1994: 24-5, 33).

Meanwhile, in the Low Countries the agencies and agents responsible for the initiation of major hydraulic programmes ranged from the counts of Flanders during the Middle Ages to private associations of venture capitalists during the early modern period. As Tys and Van Cruyningen comment the combination of aristocratic aspirations, skills in entrepreneurship and local

environmental knowledge led to the remaking of landscapes (Tys 2005; Van Cruyningen 2006). Between c.900 and c.1200 the counts of Flanders invested in embankments, dykes and other water-management technology in order to create a new economic and physical landscape which concentrated wealth and power in the hands of the counts and their followers at the expense of communities of free peasants, in parallel with feudal transformations in other European regions (Tys 2005). During the early 17th century the accumulation of capital in cities led local networks of kin and friends to invest in land reclamation projects which enjoyed varying rates of success in the short and medium terms. Over the longer term these processes reshaped patterns of land ownership into a landlord-capitalist, tenant-farmer and wage-labourer system which prospered until the Second World War, and which still influences the organisation of agriculture in the region during the current age (Van Cruyningen 2006).

Yet it is necessary to set out a complex view of the nature of progress in relation to water management. Increments in water supply, as a consequence of carefully organised water management programmes, could and did eventually lead to the land running out. Van Tielhof and van Dam (2006) discuss such a cycle in relation to the Rijnland, and how it led to reorganisation in the fiscal basis of peat dredging and land reclamation. The authors note that peat dredging proved to be less of a threat than has been suggested in preceding studies, and that communities remodelled adaption strategies to deal with losses in the land area. Thus, historical models which set out a view of human progress as one that moves from living in wet to dry landscapes misrepresent the flexibility of adaption strategies during the pre-modern period.

This comparative discussion of water management in China and the Low Countries draws attention to three factors:

1. investment in water management provided the means for intensive economic growth, as well as protection from floods;
2. water adaption strategies were connected not only to environmental processes, but also to the changing framework of political, economic and social institutions; and
3. in some circumstances hydraulic engineering contributed towards technological lock-ins and reversions to wetland landscapes.

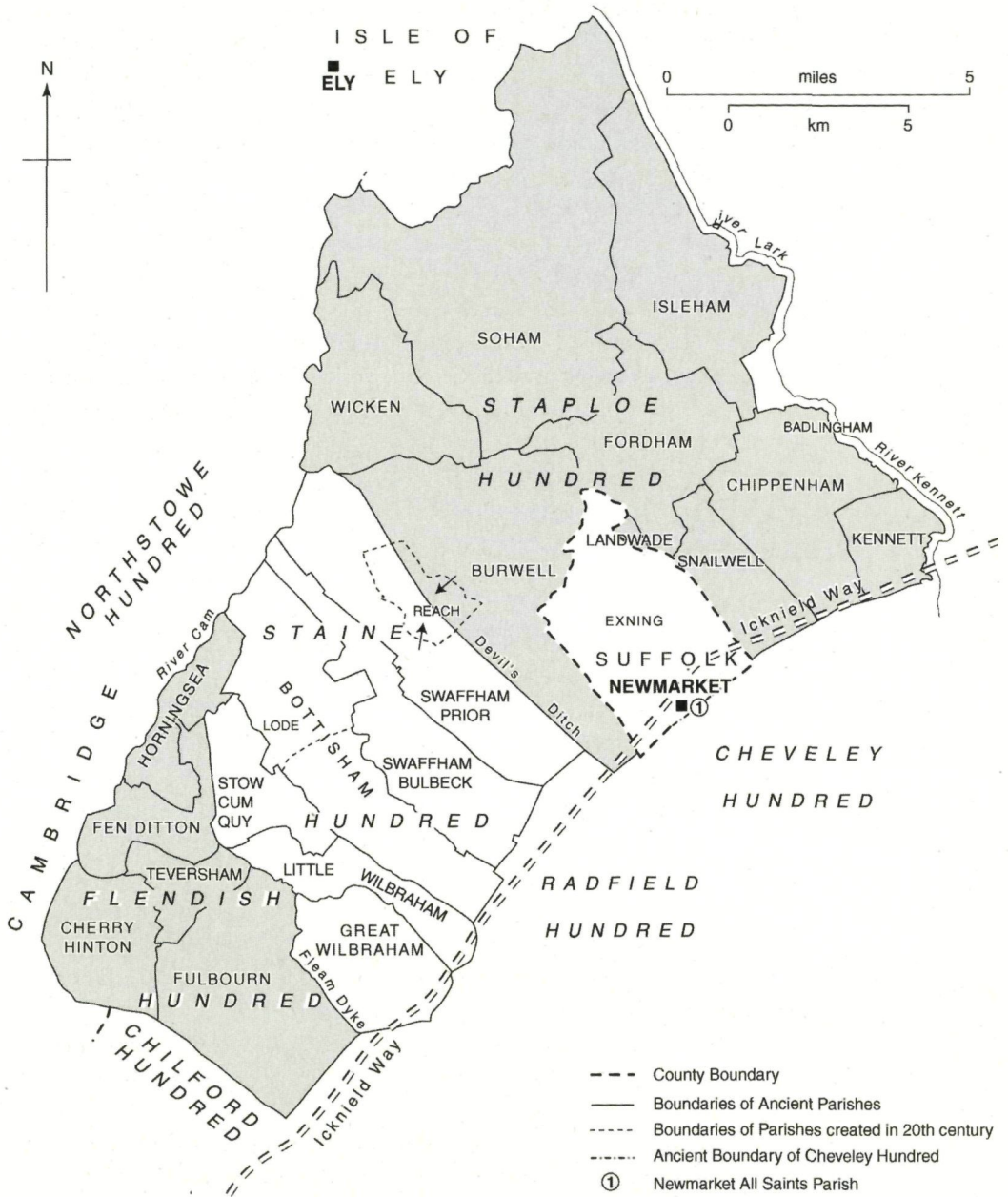


Figure 1. Parishes and hundreds in north eastern Cambridgeshire in the Middle Ages and Early Modern Period. Based on Wareham 2002:2; reproduced by kind permission of the Executive Editor, Victoria County History Series, Boydell & Brewer Ltd.

The purpose of turning to the evidence from Eastern England is to see how far these three themes are repeated, and whether its empirical evidence adds any further refinements to an understanding of the relationship between water management and the economic environment during the pre-modern period. The fenlands of this region comprise a shallow basin of around 3,360 square kilometres (1,300 square miles), divided between six eastern English counties of Lincolnshire, Northamptonshire, Huntingdonshire, Cambridgeshire, Norfolk and Suffolk, with silt and peat fens overlying Amphill and Kimmeridge clays. The peat fenlands, which comprise the richer soil on account of their vegetation content, are concentrated in the southern level of the fens, and have been the subject of an important recent archaeological survey (Hall 1996). Although water adaptation strategies which sustained pre-modern communities within the area are thoroughly documented, they have often been neglected by historians who have suggested that the key developments took place during the modern period.² Readers of 'Jaarboek voor Ecologische Geschiedenis' will be familiar with articles which pay sufficient attention to the pre-modern period, but may be less well acquainted with the historical background of north-eastern Cambridgeshire. It may be helpful at this stage to provide a short introduction to its local history.

Water management strategies in north-eastern Cambridgeshire

North-eastern Cambridgeshire lies between Cambridge (Cambs.), Ely (Cambs.) and Newmarket (Suff.). The basic framework of settlement and government which persisted until drainage was established during the early Middle Ages.³ The three hundreds of Flendish, Staine and Staploe were the successors of earlier Anglo-Saxon political units, with the Devil's Ditch separating Staploe from its south-western neighbours. By the 11th century settlement was concentrated in nucleated villages, which generally occupied well drained, slightly elevated sites, often on the divide between arable uplands and the heath or the fen. Moreover, with the exception of Kennett, which shares the Celtic name of its boundary river, the villages derived their names from Old English. Its parishes are generally divided between the fenlands in north-west, arable upland in the centre and heathland in the south-east. Whereas the fens are characterised by ill-drained and organic soils, the heath is covered with dry and light soils.

Between the early and late Anglo-Saxon periods there was a change in the economic value of the fens, as reflected in ecclesiastical sources. An 8th-century saint's life commented on 'a most dismal fen...overhung by fog' around

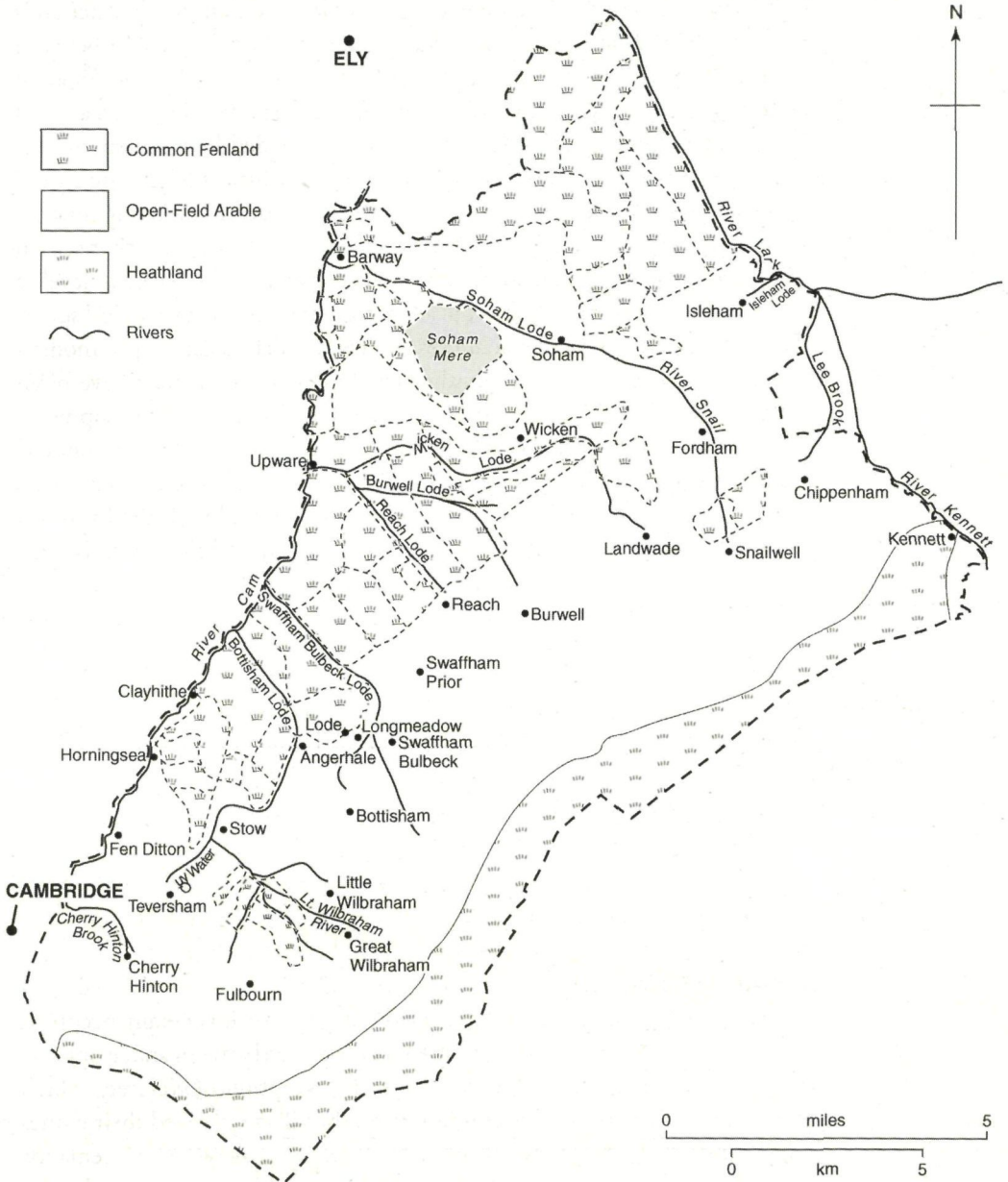


Figure 2. Landscape and settlement in north eastern Cambridgeshire c. 1600. Based on Wareham 2002: 5; reproduced by kind permission of the Executive Editor, Victoria County History Series, Boydell & Brewer Ltd.

Cambridge (Colgrave 1956: 86-7), but sources drawn up in the late 10th century and beyond commented upon the value of meres, gardens and other fenland features in poetic and narrative forms (Blake 1962: 398-9; Greenway 1996: 320-1, 348-9; Mellows & Mellows 1966: 2; see also Mackie 1934: 221). This change arose from the establishment of great Benedictine abbeys on fenland islands at Ely, Peterborough (Nhants.), Ramsey (Hunts.), Thorney (Cambs.) and Crowland (Lincs.) during the late 10th century. These monastic lords played a key role in maintaining water management programmes until the late 1530s. Yet the context for the establishment of medieval waterways is less commonly discussed, partly because of perceptions which dwell upon the 'slow and less enterprising methods of the Middle Ages' (Darby & Ramsden 1973: 268), or which claim that it was only in the 1850s that 'men too, were freed from ancient custom' as a consequence of the taming of excesses of fresh-water supply (Ravensdale 1974: 178).

It is necessary to distinguish between three types of water management engineering in the fenlands before drainage:

1. waterways cut in the Roman period which were abandoned and became silted up;
2. waterways originally cut in the Roman period, which then subject to recutting in the Middle Ages; and
3. new waterways cut in the medieval period.

During the Roman period three lodes were cut in north-eastern Cambridgeshire to link settlements on the edge of the upland with the River Cam for the transportation of farm produce and manufactured goods, but from the beginning of the 5th century changes in the fresh-water levels made it harder to keep these lodes navigable, while the silting of the fens contributed to the abandonment of settlements, associated with the wider collapse of the Roman economy (Wareham 2002: 4). Yet much of the Roman infrastructure remained in place, and was subsequently adapted in the medieval period in order to meet the transportation and marketing requirements of monastic and village communities. That not only resulted in the recutting and maintenance of Roman waterways, but also led to investment in new navigation and drainage channels. Discussion begins with investment in a transport waterway which served the needs of a great monastic community, before discussing investment in smaller navigation and drainage channels within north-eastern Cambridgeshire.

Cnut's dyke

Cnut's dyke runs from Bodsey Bridge, one and half kilometres north of Ramsey, in a south-east to north-west direction, flowing into the River Nene at Peterborough. There are several reasons for accepting Astbury's view that Cnut's dyke was built in the late 10th century rather than being a Roman construction (Astbury 1958: 125; cf. Browne 1978: 67). The Roman Car dyke and Cnut's dyke pass through similar mineral soils, but the former's embankments are much more substantial than the latter's. Moreover, late medieval and early modern sources maintained that King Cnut (1016-35) constructed the dyke named after him, while the name Cnut's dyke (Cnoutes delfe) and King's dyke (Kyngesdelf) are mentioned in early 11th-century sources. Astbury suggests that Cnut's dyke was built during the reign of King Edgar (957-75) (Astbury 1958: 126-7, 130), before being renamed on account of the visits by King Cnut and his sons to fenland abbeys by boat (Gerchow 1988: 195; Blake 1962: 153-4). The context for Astbury's hypothesis deserves further consideration.

Recent work has demonstrated that communities in the Anglo-Saxon period were skilled in building and maintaining stone and wooden bridges (Harrison 2004: 49, 52-4; Brooks 2000: 1-31). A parallel investment in waterborne communications fits neatly into a framework of substantial investment in public works. Thus, the late Anglo-Saxon state was able to mobilise resources far beyond those at the command of landowners and monastic communities in order to create public works 'pro bono' (Campbell, 2000). The specific motive for the building of Cnut's dyke was probably in order to undertake the construction of Ramsey Abbey. The *Liber Benefactorum* of Ramsey Abbey provides an account of the programme of building undertaken at Ramsey during the late 10th century, which involved the use of cantilever machines to build the stone abbey church with the two towers at the centre and west end (Macray 1886: 41). The same source also records the extensive donations of the co-founders of the community, namely Æthelwine (d. 992), ealdorman of East Anglia (962-92), and Oswald (d. 992), bishop of Worcester (961-92) and archbishop of York (972-92) (Macray 1886: 48-50, 52-5). Oswald had at his disposal the labour of thousands of tenants, while Æthelwine was the ruler of an immense ealdormanry stretching from East Anglia to the south-east Midlands (Dyer 1996; Hart 1992). The alliance between royal, monastic and aristocratic power may also have reached out to include communities of free peasants, who would also have benefited from the economic gains which arose from the building of a transport waterway which directly linked the fen-edge to the River Nene.

The original context for the construction of Cnut's dyke can be compared with Monks' lode. Both waterways were probably built in order to move stone into the fenland shires for the construction of Benedictine and Cistercian abbeys respectively. Furthermore, Astbury suggests that the northern section of the River Lark, which marks the eastern boundary of north-eastern Cambridgeshire, was straightened and deepened in order to move stone for the construction of Bury St Edmunds Abbey (Suff.) (Astbury 1958: 155-6). Yet these waterways once built supported the cheap transportation of other commodities. The monks of Ramsey and Peterborough exchanged eels for Barnack limestone (Hart 1966: 112-13) and other goods were probably transported by boat for sale at centres such as Cambridge and Thetford (Norf.). In short, some of the major fenland waterways generally identified as roman were probably built during the early Middle Ages, while other roman waterways were recut and redirected in order to meet the needs of monastic lords and their tenants in village communities.

Reach and High lodes

Cnut's dyke was linked to a network of lesser waterways. Reach lode in north-eastern Cambridgeshire, originally cut in the Roman period (Royal Commission of Historical Monuments 1972: 129), was probably recut in the late Anglo-Saxon period, with its role as a trading waterway being documented from the early 12th century onwards (Hart & Lyons 1886: ii, 202).⁴ It stretched for four and half kilometres, and by 1443 there was a 180-meter hythe, built of chalk rubble, at the terminus.⁵ During the 15th and 16th centuries corn taken from Ramsey Abbey's estates was shipped through Reach, and its inhabitants bequeathed to heirs entire or part shares of keels, lighters and barges.⁶

Although the medieval fenland waterways which have been discussed were primarily built as part of a transport infrastructure, others, such as High lode, were non-navigable drainage channels. This curving lode, first recorded in 1580, was almost certainly cut for the first time during the Middle Ages, running southwards and westwards until it met the navigable Weirs which flowed into Reach lode.⁷ It was replaced by Burwell lode, cut by 1685, which ran directly from south-east to north-west in order to drain the parish's fens (Royal Commission of Historical Monuments 1972: 42). Yet for centuries it was the medieval waterway which maintained the value of Burwell's fenlands. Of course, the creation of the embankments in medieval European wetlands altered micro-environments, leading to the introduction of swans, ducks and herons in place of curlews and black-tailed godwit (Hoffman 1996). In north-

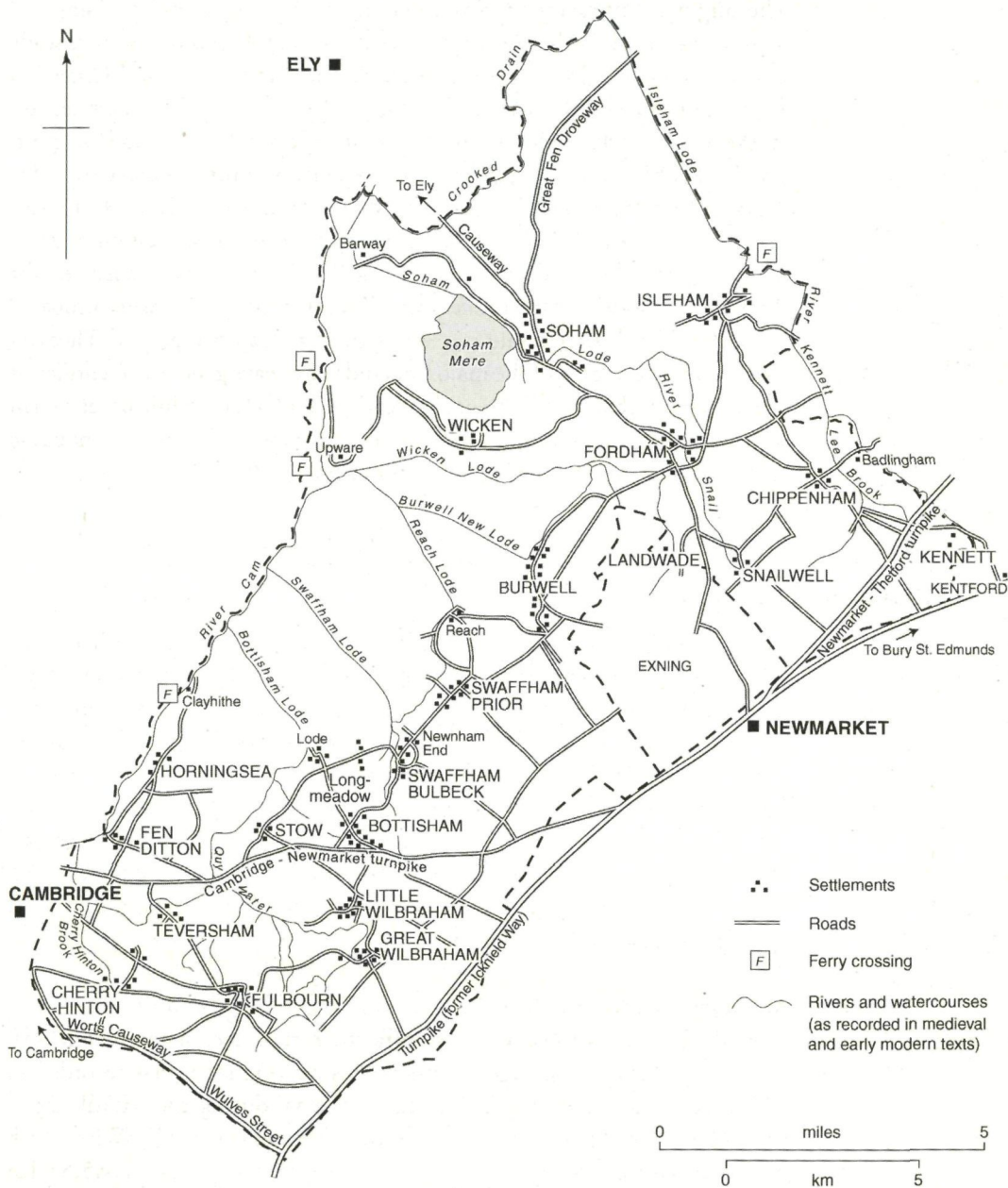


Figure 3. Communications in north eastern Cambridgeshire c.1800. Based on Wareham 2002: 13; reproduced by kind permission of the Executive Editor, Victoria County History Series, Boydell & Brewer Ltd.

eastern Cambridgeshire the wealth of the great eel fisheries at Bottisham and Wicken perhaps arose from embankment during the late Anglo-Saxon period (Farley 1817-30: i, fols. 195d, 196a).

The general premise that medieval communities were characterised by a minimalist response towards water management runs against the tide of evidence. Here it has only been possible to highlight two aspects:

1. the construction of waterways depended not only upon the agency of the state, but also upon the involvement of a range of local communities; and
2. new waterways and embankments were part of a transport and drainage infrastructure which reshaped the economy of micro-environments.

TeBrake comments: 'many cultures have found ways of living from such bounty without actually draining them' (TeBrake 2000: 106). There were regional variations in the ways in which communities managed landscapes subject to seasonal flooding. The pre-drainage management of the fens in north-eastern Cambridgeshire was primarily directed towards the raising of livestock and the production of dairy produce. There was no interest in the construction of polders. Nor was there a reversion to settlement patterns under the Romans, when interlocking waterborne and road communications had linked seven settlements on the fen edge (Wareham 2002: 4). During the summer months the fens were given over to the grazing of livestock, but in the winter sedge and turf were cut for fuel and building materials, with the livestock being kept on the heath and fed with hay previously harvested from meadows and fens. Shared access to fenland grazing rights was regulated through custom or pecuniary arrangements.

It is worth taking a closer look at some of these arrangements as set out in the legal evidence. From the early 13th century the tenants of the bishop of Ely in the parishes of Fen Ditton and Horningsea had exercised rights of common between the fens in both parishes and Bottisham,⁸ while in the 14th century the three principal landowners in Swaffham Bulbeck and Swaffham Prior shared the profits from agisting cattle on the fens.⁹ Financial payment allowed the men of Fordham who were not tenants of the Duchy manor to feed their livestock on Soham's commons during the 1340s.¹⁰ Of course, tensions arose between communities as a consequence of the regulation of the commons. In 1533 the villagers of Fordham were ordered to stop feeding more beasts on the fens in the summer than could be maintained during the rest of the year.¹¹ Perhaps there was a connection between these events and the complaints in 1560 from neighbouring Snailwell that the men of Fordham were cutting turf from Snailwell's fen.¹² The negotiations over common rights served to define the relationships within and between fenland communities so that effective economic equilibria were struck, with a restriction on the development of property rights within the fens.

Against this background it is worth briefly considering Cambridgeshire's social structure during the early modern period. In fen-edge parishes during the late 16th and early 17th centuries there were a high proportion of moderately prosperous householders in contrast to the divergence in the arable upland parishes between prosperous yeomen farmers and agricultural labourers (Spufford 1974: 28, 41-5; Id. 2000: 8). Moreover, as Spufford points out, a person who was taxed on two hearths in the fens was better off than his or her counterpart living in the arable uplands (Spufford 2000: 8). Although there are difficulties with relating the late 17th century hearth tax data to vernacular architecture, it is normally reckoned that in Cambridgeshire a one-hearth house had between two and four rooms and was generally occupied by a labourer and his family, while a two-hearth residence generally housed a husbandmen and his kin with up to six rooms. The relative importance of peasants of a middling rank meant that the aristocracy had a relatively low profile. The larger residences of the gentry and titled nobility were concentrated in the south-west of the county during the 17th century (Evans & Rose 2000: xxxi, lxviii -map A.9), and within north-eastern Cambridgeshire only Chippenham Hall, with thirty-nine hearths, was occupied by a family who belonged to the titled nobility.¹³ This pattern is most clearly demonstrated in Soham. In 1664 three-quarters of its population lived in one- and two-hearth houses, and a far smaller percentage of its householders were exempted from taxation, probably on account of poverty, than in the neighbouring parishes of Fordham and Isleham (Evans & Rose 2000: xxxix). Hence it provides a suitable case study for understanding the social context of drainage.

During the Middle Ages barely a tenth of Soham, comprising 5,250 hectares (12,999 acres), had been devoted to arable farming under the open-field system.¹⁴ Soham was dominated by its fens and mere. In 1625 its fens were reckoned to comprise 3,398 hectares (8,398 acres), including Borders fen at 844 hectares (2,087 acres),¹⁵ while c.1800 the mere was assessed at 554 hectares (1,369.5 acres) (D. & S. Lysons 1808: 254). During the Middle Ages the mere and fens were exploited for pasturage, fishing, sedge and turf.¹⁶ Between the early 16th and the mid 17th centuries the fenland grazing of cattle, sometimes taken in from outside the parish, had supported a rising population linked to a general national trend.¹⁷ Manor courts from the 14th century tried to prevent over-cutting which led to the fens becoming waterlogged,¹⁸ but these orders were regularly ignored, as villagers carried turf and sedge for sale in Cambridge.¹⁹ The value of fenland resources meant that village communities defended fen commons from intrusion by neighbours' flocks and herds, but Soham and Fordham shared extensive commons and moors from the mid 14th century until the late 17th.²⁰ In short, there were strong economic reasons for not proceeding with the drainage of Soham mere and fens from the perspective of the local community, and the parish was unaffected by Vermuyden's drainage programme.

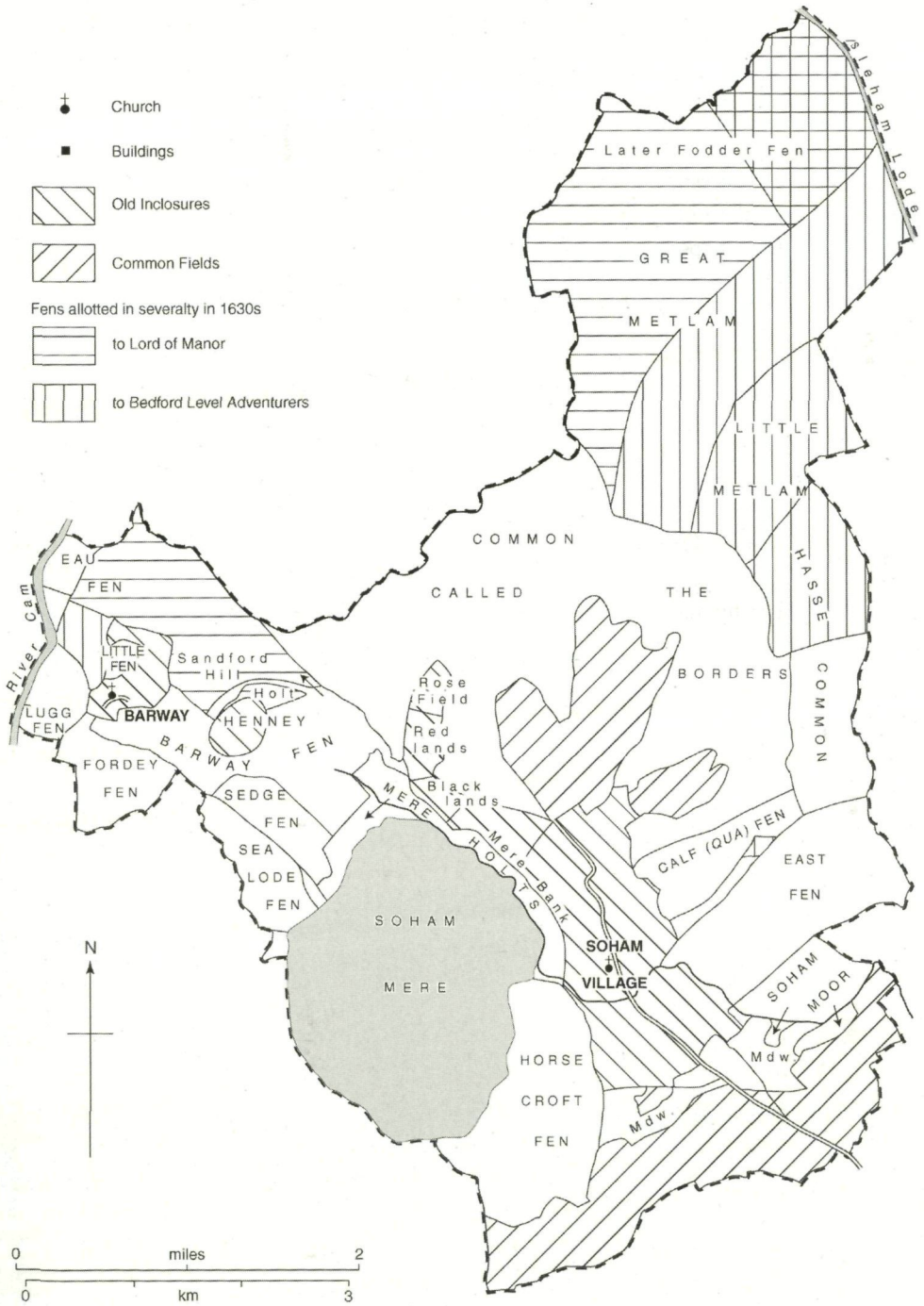


Figure 4. Soham's fens in the 1630s. Based on Wareham 2002: 490; reproduced by kind permission of the Executive Editor, Victoria County History Series, Boydell & Brewer Ltd.

Between 1630 and 1652 Vermuyden directed works under the commission by Sir Francis Russell (1593-1641) and the Bedford Level Adventurers in order to drain the fens (Darby 1956 & 1983; Harris 1953; Summers 1976). Their work has generally been viewed as the central feature in the transformation of fenland landscapes from a watery wilderness to an affluent landscape, leading to the establishment of the Bedford Level Corporation. In such accounts local communities generally feature as the opponents of progress, living up to perceptions of fenland men and women as inward-looking, suspicious of strangers and slow to change (Chamberlain 1975; Houghton 1988). Yet such approaches pass over the complexity of the local context, and the role played by smaller scale water management projects.

Perhaps local initiative to drain Soham's fenlands would have proceeded more smoothly if the Thornton family had remained as the principal resident landholders within the parish. The dynasty was descended from a villager who in the 1410s had been a bailiff and lessee of the largest manor in Soham, namely Duchy manor,²¹ but in 1580 John Thornton (d. 1598) purchased Snailwell manor and the family became resident squires there.²² In 1626 the Duchy manor was sold by the Crown to Sir Robert Heath, solicitor, attorney general and chief justice of the Common Pleas (1631-4) of King Charles I (1624-1649).²³ Between 1621 and 1634 Sir Robert Heath received an income of around £200,000 (Kopperman 1989: 247), which gave him the means to set about Soham's improvement. He can be compared with the merchants, lawyers and entrepreneurs who established consortia in the establishment of drainage programmes in the United Provinces during the same period. He reckoned that drainage would increase the annual rents rendered from Soham mere and its neighbourhood from £30 to £10,000 per annum.²⁴

He began by seeking to regain control of the Duchy estate, demesne and copyhold. Lax management had enabled the tenants to lease their copyholds, fell timber, let buildings decay and avoid paying heriots. The tenants, though, blocked his scheme by claiming that it was no longer possible to differentiate between leased demesne strips from lands held by other types of tenure.²⁵ Heath responded by successfully limiting the common rights of turbarry. Newly erected cottages were not allowed common rights, which were henceforward to be linked to the ancient number of hearths in each house. Of course, such measures may also have helped the more established middle-ranking families within the village to consolidate their common rights within the fens. Following an enquiry in 1627-8, Heath began to enclose 809 hectares (2,000 acres) of fens, mostly in Great Metlam fen,²⁶ but in 1630 protestors, bearing cudgels and pitchforks and placing the women at the front of their ranks, intimidated the workers who were setting out fenced-off enclosures.²⁷

Such action, though, did not provide a permanent solution of the dispute in the community's favour. Probably in order to resolve the matter a crowd from Soham halted the coach of Queen Henrietta Maria, when it was passing through Soham, perhaps to present a petition that would secure the reversion of the Duchy manor as dower property, but King Charles responded by ordering the sheriff in 1633 to suppress the 'rebels'.²⁸ The village community, though, gained the upper hand with the collapse of royal authority in May 1641, when fences were thrown down, trees which had been planted on the mere side were felled, cattle were agisted and mowing was undertaken.²⁹ Only with the passing of the Bedford Level Act in 1663 was there any real progress: it allowed villages possessing common rights to have the remaining commons divided among them in small allotments proportional to the number of rights which they had owned, and established the constitution of the Bedford Level Corporation (Darby 1956: 78; Wareham 2002: 16). The division of Soham's fens was authorized in 1665-6, with lots averaging 6.5 hectares (c.16-17 acres) being divided among 247 commoners while certain areas were left in common for poorer villagers.³⁰

A generation later part of Soham's fens were being cropped with wheat, oats and coalseed.³¹ The establishment of peace and a new means of exploiting Soham mere during the 18th century can be putatively connected to artistic evidence. An engraving of Soham mere by C.J. Beck, based on the painting by Claude-Joseph Vernet (1714-1789), depicts a picturesque and prosperous scene (see figure 5). The purpose of the engraving may not only have been to reflect upon the remaking of the landscape, but perhaps also to comment upon the establishment of social stability, following the turmoil of the mid 17th century, although of course much more needs to be known about the context of the local distribution of Beck's work.

Progress in the drainage of the fens was intermittent. Visitors to the fen-edge parishes commented on flooded landscapes: Richard Blome in 1673 noted that the county of Cambridge was 'not over fertile, occasioned by its Fenns on the northern part so over-charged with water [...] fenny grounds grow great store of willows, of which the inhabitants reap good profit by making baskets etc.' (Blome 1673: 49). Yet the involvement of local communities at Soham and elsewhere in fen drainage from the early 1670s began to initiate a series of changes. For instance, in 1672 joint action by the lords of Stow-cum-Quy and Fen Ditton secured the drainage of a 40-hectare (100-acre) block of fen which lay in both parishes and which had been allotted to the Bedford Level Adventurers in 1637, with the water being extracted via windmills and a run-off channel connected to White Lake stream.³² Fictitious lawsuits were used



Figure 5. Engraving of Soham by C.J. Beck. Reproduced with the kind permission of the Cambridgeshire Collection, Cambridge Central Library.

on occasion to secure co-operative initiatives, such as at Bottisham in 1677, when lords, gentry and forty-five commoners resolved to have the remaining common rights allotted in severalty in lieu of common rights attached to houses.³³

Following the establishment of the Swaffham Drainage Commission in 1767 there were advances across the region in the drainage and allotment of fens. With enclosure from c.1800 in Flendish and Staine hundreds the earlier allotments were largely ignored, but in Staploe hundred they were respected, and 17th- and early 18th-century channels and droveways have continued into the 21st century to provide the framework for land ownership and fenland drainage (Wareham 2002: 4). In the late 19th century, however, the traditional link between heath, upland and fen started to fray as a consequence of the development of gallops and stud farms on the heath land linked to horse-racing at Newmarket, and brought an end to transhumance between the three landscape types (Wareham 2002: 18, 20). Yet before the late 19th century co-operative uses of these three landscapes sustained local economies and communities, which were in turn dependent upon the application of a range of successful water adaption strategies.

Discussion

This article considers the purposes and contexts of the establishment of pre-modern water management strategies within a comparative framework. Of course, differences in national contexts led to quite divergent lines of development in terms of the relationship between water management and the political order. Yet the combination of micro-history with comparative history leads into the type of new analytical perspective envisaged by Zeischka (2006). This article has focused attention upon the relationship between economic and social factors, but in so doing has touched upon other key themes, such as the importance of legal evidence. There is a notable contrast in the absence of the role of law in regulating water management during the early Middle Ages with its prominence in the later medieval and early modern sources. This difference raises questions on whether the relationship between law and community during the earlier medieval period made it easier to introduce large scale water management programmes than in succeeding centuries, or whether there is just a change in the volume of evidence?³⁴ If there is to be a comprehensive understanding of the issues which shaped the introduction of new water management programmes in medieval and early modern eastern Cambridgeshire within a comparative framework, then the relationship between law and water management needs to be fully addressed. For the present, though, this article seeks to draw attention to some of the key factors which lay behind the introduction of water management strategies in the pre-modern period.

Water adaption strategies in the medieval and early modern societies discussed here were not characterised by inactivity until challenged by the crises of floods, or the opportunities offered by capitalism. Instead they were defined by striking an appropriate balance between environmental risk and economic improvement. Although it may appear from a contemporary perspective to be a counter-intuitive statement, pre-modern communities may have chosen not to proceed with drainage and land reclamation in the enforcement of such strategies. In that context it is necessary to dispense with the a priori assumption that landscapes which are periodically flooded are synonymous with economic bottlenecks. Here it is worth comparing developments in the fenlands of Eastern England during the early Middle Ages with events at Soham during the 17th century. In the early Middle Ages the benefits which arose from the construction of dykes and embankments convinced communities to work with the agency of the state in the remaking of the environment. Economic gains included a lowering of transportation costs and the creation of a landscape which supported a system of farming geared towards yielding profits through the grazing of livestock. This economic organisation also provided poorer households with livelihoods from fishing

and cutting sedge and turf, and remained in place until there was a shift towards new water adaption strategies during the 17th century. Yet Heath's proposals for the drainage and enclosure of Soham mere collapsed because the village community was dominated by those who belonged to the middle and lower ranks, and who judged that their families would not benefit from his programme. But, Heath's project did not fail because of lack of capital, or an absence of technological knowledge. Only with the community's participation was it possible to proceed with the making of a new landscape.

Three observations follow from this study:

1. pre-modern water management was shaped by the relationship between environmental processes and the economic environment;
2. water adaption strategies often worked with excesses of water supply in order to flood the landscape on a seasonal basis, setting to one side the opportunities of drainage; and
3. the co-operation of local communities was of critical significance in the application of new water management programmes.

These issues have a contemporary resonance. The reflooding of 5,000 hectares (12,300 acres) of fen wetlands is currently progressing as part of a twenty-year programme through the agency of the West Fens partnership.³⁵ Meanwhile, the National Trust intends to acquire c. 3,500 hectares (8,600 acres) in north-eastern Cambridgeshire over the next hundred years so as to create a 'green lung' for the city of Cambridge, which will enable the grazing of livestock and the growing of 'green crops', such as reeds and bio-fuels, linked to the provision of recreational facilities.³⁶ Questions arise on the sustainability of such planned economic and environmental systems without on-going subsidies from charities and government agencies, after the initial enthusiasm (and financial benefits) associated with the original donations have passed. Alternatively there may need to be a change in the political environment which accepts the need for greater taxation in order to meet such costs. In short, an understanding of the dynamics of pre-modern fenland landscapes relates to some of the planning initiatives currently under consideration within the fenland shires as a consequence of environmental, economic and social factors.

The issues raised here also relate to contemporary developments in parts of the world where water management projects are moving in the opposite direction; namely the withdrawal of substantial volumes of water from rivers which lead to reductions in floodwater levels and the minimisation of the areas which benefit from and are sustained by floodwaters. For instance, the Okavango basin in southern Africa is flooded annually, but its outflow does not flow into the sea. The recent decision by the Namibian Government to

proceed with the construction of a dam on the River Okavango upstream of the basin's delta, so as to generate electricity, will reduce the river's outflow into the basin, and hence the extent to which it is flooded seasonally.³⁷ The basin includes national parks of outstanding natural beauty, and local inhabitants rely upon tourism for their livelihoods. It is to be hoped that this new water adaption strategy will meet their needs, as well as those of industrialisation. In short, water management is linked to the integration of complex human and environmental processes, which can both nurture and hinder economic growth.

Two arguments are being put forward here in relation to the application of pre-modern history to creating and maintaining sustainable communities and economies in the current age and for the benefit of future generations. Firstly, and principally in relation to the developed world: the remaking of landscapes, which takes account of earlier and no longer extant environments in the light of climate change, will be best served by drawing upon extensive documentary evidence in association with archaeology, landscape studies and other related disciplines. Secondly, and more notably in relation to the developing world: knowledge of water management in richly documented rural societies in the past can be applied to the development of appropriate strategies in present day rural communities in Africa, Asia and Latin America. Against a backdrop of pronounced climatic change, water management adaption strategies need to be flexible, taking account of a wide range of micro-environmental outcomes and their relationships with the politics of unequal entitlement in both the developing and developed worlds (Sen 1999). The twin tragedies of flood and drought, as much as the spectres of famine and dearth, can be prevented through policy making based on sound knowledge, which does not turn exclusively to either the agency of the state or to the market, or for that matter any other single-agency panacea.

Notes

- 1 The author is grateful to seminar audiences at Leiden and London (the Institute of Historical Research and the School of Oriental and African Studies) and the editors and referees of 'Jaarboek voor Ecologische Geschiedenis' for their comments.
- 2 Darby (1940) is concerned with agriculture and settlement, while Hills (1967) focuses upon the modern period.
- 3 Unless otherwise stated this paragraph is based on Wareham (2002: 4, 10).
- 4 In the early 1070s when King William I (1066-87) stationed troops to guard the dyke (*forea*) against the forays of the rebel forces of Hereward the Wake (Blake 1962: 182).
- 5 Cambridge University Library (CUL), EDC, 7/12/6: court roll 21 Henry VI.
- 6 The National Archives: Public Record Office, London 1986, *Calendar of Patent Rolls, 1566-9* (TNA: PRO 1986), p. 285; SC 6/765/11-12; PROB 11/4, fol. 58; 11/17, fol. 81 and v.; 11/18, fol. 40; 11/20, fol. 77; 11/51, fol. 167v.; 11/75, fol. 270v.; British Library London (BL) Additional MS. 5861, fol. 81v.
- 7 Cambridgeshire County Record Office (CCRO) R/55/7/81: [21] Elizabeth I; TNA: PRO LR 3/9A, p. 17.
- 8 The National Archives: Public Record Office, London 1985: *Curia Regis Rolls, volume eleven* (TNA: PRO, 1985), pp. 44-5; *Ibid.*, SC 2/155/53, m. 7.
- 9 Belvoir Castle Muniments, Burgh Hall ct. rolls 48 Edward III; 22 Richard I.
- 10 TNA: PRO, Duchy of Lancaster (DL) 29/288/4717-18, 4721.
- 11 CCRO, L 1/75/5, 6, 8.
- 12 TNA: PRO, STAC 2/23, no. 172.
- 13 TNA: PRO, E 179/244/23, rot. 75.
- 14 CCRO, map 1656; Pembroke College Cambridge Muniments, Soham O 8, 9.
- 15 TNA: PRO, E 134/3 & 4/Charles I/Hilary 5, m. 4.
- 16 The National Archives: Public Record Office, London 1905: *Close Rolls of Henry III, 1231-4* (TNA: PRO, 1905), p. 218; BL Lansdowne Charter 108; *Ibid.*, STAC 2/3 no. 162; DL, 30/1/9, m. 6; DL 30/1/11, m. 2, 5d; DL 30/1/12, m. 4d; DL 30/1/14, m. 3d; DL 30/1/15, m. 1; DL 30/1/16, m. 1; E 318/3/133, m. 4; REQ 2/111/8; 2/166/18.
- 17 *Ibid.*, E 179/81/163, m. 2 and d.; REQ 2/272/19; Pembroke College Cambridge Muniments, Soham, N 3; BL Harleian MS. 595, fol. 105; CCRO, P 142/1/1-2.
- 18 TNA: PRO, DL 30/1/9, m. 6; DL 30/1/11, m. 5d.; DL 30/1/12, m. 4d.; DL 30/1/14, m. 3d.; DL 30/1/15, m. 1; DL 30/1/16, m. 1; DL 30/1/18.
- 19 TNA: PRO, DL 30/1/11, m. 2.
- 20 Pembroke College Cambridge Muniments, Soham, B 10; PRO, JUST 2/18, rot. 23d.; C 229/2, no. 31; CCRO, 107, map of Soham in 1656, sheets C-E.
- 21 TNA: PRO, DL 29/290/4766, 4771; DL 29/291/4780; DL 29/292/4794.
- 22 *Ibid.*, CP 25/2/93/844/22 & 23 Elizabeth I Michaelmas, no. 9.
- 23 BL Egerton MS. 2987, fol. 117; CUL, Doc. 1484; for wider context, see Kopperman (1989).
- 24 BL Egerton MS. 2987, fols. 67, 64; Kopperman (1989: 260).
- 25 BL Egerton MS. 2987, fol. 14; fols. 101 and v.; 126v.
- 26 TNA: PRO, E 126/3, fols. 232v-33v.; E 134/3 & 4 Charles I/Hilary 5.
- 27 BL Egerton MS. 2987, fols. 27-32.
- 28 *Ibid.*, fols. 37v-42v.
- 29 *Ibid.*, fols. 108v.; 111, 115, 118-19.
- 30 PRO, E 126/14, fols. 346v.-48; E 134/35 Charles II/Michaelmas 54, mm. 2-8; C 229/4, nos. 23, 37; C 229/5, nos. 6, 10-11, 13, 24; C 229/8, nos. 21, 48.

- 31 Pembroke College Cambridge Muniments, Soham M 11.
- 32 CCRO, R 59/31/6.
- 33 Ibid., R 59/14/2/16/2.
- 34 Water rights and the law are discussed by Getzler (2004). The author is grateful to John Langdon for discussion of this issue.
- 35 For progress on this venture, see the website of the Royal Society for the Protection of Birds: <http://www.rspb.org.uk/england/eastanglia/fens/wetlandcreation/wetlandcreation.asp>.
- 36 For these developments, which are related to but distinct from the National Trust's property at Wicken Fen (Cams.), see <http://www.wicken.org.uk/newpage2.htm>.
- 37 For recent developments in the Okavango basin, see <http://www.irn.org/programs/okavango/>.

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Water management and the economic environment in Eastern England

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