RESILIENT SOCIETIES, VULNERABLE PEOPLE: COPING WITH NORTH SEA FLOODS BEFORE 1800*

I

VULNERABILITY: FROM PEOPLE TO SYSTEMS AND BACK AGAIN

In recent years, an increasing number of historians have argued forcefully for the vulnerability of pre-industrial societies to natural hazards or shocks. New and exciting data on climatic variation in the past reveal impressive climatic and environmental fluctuations and these fluctuations seem to coincide with major social, economic or political transformations. Forget about markets, institutions or power relations; 'It is the climate, stupid!' has become the battle-cry of a new generation of historians, exemplified by Geoffrey Parker's 2013 analysis of the 'Global Crisis' of the seventeenth century and Bruce Campbell's more recent 'Great Transition' on the Black Death.[1] Although all of these authors are careful to state that the extreme vulnerability of the societies under study is a product of both social and natural dynamics, variations in natural conditions — steered by solar activity, volcanic eruptions or El Niño events — seem to offer the best explanation of why some periods in history were so particularly disaster prone. Without doubt, this new generation of 'environmentalists' among historians have a point when drawing our attention to the neglected role of climatic, biological and geophysical processes in history. After all, pioneers in climate

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[1] Geoffrey Parker, *Global Crisis: War, Climate Change and Catastrophe in the Seventeenth Century* (New Haven, 2013); Bruce M. S. Campbell, *The Great Transition: Climate, Disease and Society in the Late-Medieval World* (Cambridge, 2016), although much more nuanced with respect to the chain of causality.

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history such as Emmanuel Le Roy Ladurie or Christian Pfister have been developing similar arguments for decades, but it is only now that their arguments have gained in credibility, as they are supported by paleo-climatic data other than historical documents.[2]

One of the strengths of modern environmental history is its engagement with the grand narratives of history, revisiting the rise and fall of civilizations — for example, the fall of the Roman Empire, the classic Maya collapse or dynastic cycles in China[3] — from an integrated approach of society and nature, with a prominent role for climatic and geophysical or biophysical upheavals. Spells of extreme weather did not just influence agricultural yields, but interacted with hunger, epidemics, military uprisings, the disruptions of maritime and inland trade and so on to produce structural transformations in the way societies were organized. This kind of holistic approach of society and nature ties in neatly with developments in environmental sciences. After World War II, biologists moved away from studying isolated plants or animals and instead turned their attention to the complex systems in which these organisms lived. Such a systemic, ecosystem-based approach is the foundation of modern environmental sciences.[4] In recent years, the study of ecosystems has been enlarged to include social variables, producing so-called socio-environmental systems.[5] Both ecosystems and socio-environmental systems are prone to variation and evolution, going through 'adaptive cycles' of growth, increasing rigidity, collapse and reorganization.[6] According to the ecologist and system-theorist Marten Scheffer, systems can only absorb a certain amount of disturbance.

[2] Emmanuel Le Roy Ladurie, *Histoire du climat depuis l'an mil* (Paris, 1967); and more recently, Emmanuel Le Roy Ladurie, *Histoire humaine et comparée du climat*, 3 vols. (Paris, 2004–9); Christian Pfister, *Das Klima der Schweiz von 1525–1860 und seine Bedeutung in der Geschichte von Bevölkerung und Landwirtschaft*, 2 vols. (Academica Helvetica, vi, Bern, 1984–5), i, *Klimageschichte der Schweiz 1525–1860*.

[3] Often published in top-ranking scientific journals such as *Science* or *Proceedings of the National Academy of Sciences of the United States of America* (*PNAS*): see Ulf Büntgen *et al.*, '2500 Years of European Climate Variability and Human Susceptibility', *Science,* cccxxxi (4 Feb. 2011), 578–82.

[4] Donald Worster, *Nature's Economy: A History of Ecological Ideas* (San Francisco, 1977), 342–82.

[5] Fikret Berkes and Carl Folke, *Linking Social and Ecological Systems: Management Practices and Social Mechanisms for Building Resilience* (Cambridge, 1998).

[6] Brian Walker *et al.*, 'Resilience, Adaptability and Transformability in Social–ecological Systems', *Ecology and Society*, ix, 2 (2004).

Vulnerability occurs when a system can no longer absorb the endogenous or exogenous disturbances it is exposed to. Once a certain 'threshold' or 'tipping point' is reached, qualitative change comes into play and the system might move to a new equilibrium.[7] From such a perspective earthquakes, epidemics, floods or droughts might be the triggers or accelerators which push a system over the top. Inspired by Scheffer's system theory, Bruce Campbell recently reframed the mid-fourteenth-century Black Death as the ultimate — or perhaps unique? — example of such a process. In Campbell's words, the Black Death was 'the perfect storm . . . possessing truly transformative force. Europe's already floundering socio-ecological regime was terminally undermined and a long downturn initiated'.[8]

However, locating vulnerability to climate extremes and nature-induced hazards at the level of systems or socio-environmental regimes also raises quite a few problems, not least with regard to the difficulty of demonstrating causality between natural variability and societal change, or the difference in geographic scale between global atmospheric disturbances and the often very regional or even localized societal transformations.[9] Scaling down the analysis to coherent regions and well-defined hazards, research on natural disasters from the past will often confirm the conclusion of Georgina Endfield in her discussion of extreme drought and floods in colonial Mexico: despite an often rapid succession of devastating floods and droughts, socio-environmental systems in colonial Mexico did not collapse. Through absorption and adaptation they proved 'remarkably resilient' to such problems.[10]

Resilience is the key concept in this debate, albeit a rather problematic one. In ecosystem analysis, resilience initially indicated the 'buffer capacity' of a system, its ability to absorb perturbation. From such a perspective resilience was either measured through the magnitude of the disturbance which could be absorbed before structural change occurred or, alternatively,

[7] Marten Scheffer, *Critical Transitions in Nature and Society* (Princeton, 2009); see Campbell, *Great Transition*, 23–4.

[8] Campbell, *Great Transition*, 329.

[9] Paul Warde, 'Global Crisis or Global Coincidence?', *Past and Present*, no. 228 (Aug. 2015).

[10] Georgina H. Endfield, 'The Resilience and Adaptive Capacity of Social-environmental Systems in Colonial Mexico', *PNAS*, cix, 10 (2012), 3677.

through the time it took to recover from disturbance.[11] Today, older conservative definitions of resilience — measuring the restoration of the previous equilibrium — are replaced by more progressive ones, seeing adaptation and even transformation of the system as something positive rather than negative. Apart from the buffer capacity of societies (absorption or 'bouncing back'), two further levels of resilience are usually discerned: 'adaptive capacity' — adjusting responses to changing external and internal pressures, and 'transformative capacity' — the capacity for fundamental reorganization of the system in order to overcome such pressures.[12] If adaptation and even transformation are seen as signs of resilience rather than vulnerability, only total disintegration or collapse remain as clear proof of vulnerability at the systemic level.

Furthermore, framing vulnerability and resilience in the language of systems analysis might be rather common in environmental sciences,[13] but it is far less evident in social sciences and the humanities: most historians no longer think of past societies as integrated functional systems which could become vulnerable or collapse in ways Oscar Spengler or Arnold J. Toynbee would have conceived of.[14] To be sure, environmental historians adopting systemic perspectives from ecosystem analysis are not always attributing functionality, let alone intentionality, to the socio-environmental systems

[11] Resilience became a popular concept following the publication of C. S. Holling, 'Resilience and Stability of Ecological Systems', *Annual Review of Ecology and Systematics,* iv (1973). Later the concept migrated to the study of socio-environmental systems as well: W. Neil Adger, 'Social and Ecological Resilience: Are They Related?', *Progress in Human Geography*, xxiv, 3 (2000), 361. For its use in disaster studies, see Sandrine Revet, 'Penser et affronter les désastres: un panorama des recherches en sciences sociales et des politiques internationales', *Critique Internationale*, lii (2011); Bas van Bavel and Daniel Curtis, 'Better Understanding Disasters by Better Using History: Systematically Using the Historical Record as One Way to Advance Research into Disasters', *International Journal of Mass Emergencies and Disasters,* xxxiv, 1 (2016).

[12] Revet, 'Penser et affronter les désastres', 170; Christophe Béné *et al.*, 'Is Resilience a Useful Concept in the Context of Food Security and Nutrition Programmes? Some Conceptual and Practical Considerations', *Food Security,* viii, 1 (2016), 125.

[13] To cite but one influential example, see Robert Costanza, Lisa J. Graumlich and William Steffen (eds.), *Sustainability or Collapse: An Integrated History and Future of People on Earth* (Cambridge, Mass., 2007).

[14] Peter Burke, *History and Social Theory*, 2nd edn (Ithaca, 2005), 127–40. For the resurgence of 'rise and fall' narratives in environmental history, see Karl W. Butzer, 'Collapse, Environment and Society', *PNAS,* cix, 10 (2012), 3632–3.

studied. Often they seem more concerned with demonstrating the coherence and permanent co-evolution of the human and non-human components of that system.[15] Even such an assumption of coherence might be a bridge too far for many social scientists. Actor-Network Theory for instance conceives of society–nature relations as open, dynamic and undetermined networks of human and non-human actors and 'actants'.[16] For ANT-scholars, such networked configurations are completely devoid of either linearity or functionality. Quite paradoxically however, in their rejection of the nature–culture divide, some Actor-Network inspired authors such as Donna Haraway once again imbue the 'multispecies assemblages' they study with an inherent logic or desired outcome — for Haraway, the contribution to 'Earthly Survival' allows her to qualify some assemblages as more 'robust' than others.[17]

Whether discussing the robustness of a 'multispecies assemblage' or the resilience of a socio-environmental system, one fundamental problem basically remains the same, namely the assumption of a 'flat' social space, in which social inequality, power hierarchies and individual human agency are largely erased.[18] This is highly problematic. Take, for example, the 1755 Lisbon earthquake, which is often seen as a major rupture in Portugese history, as not only the economy, politics and the spatial layout of the capital, but even ideas on nature, humans and divine interference were profoundly reshuffled. At

[15] As reflected for instance in the work of the Vienna school of Social Ecology: Helmut Haberl *et al.* (eds.), *Social Ecology: Society–Nature Relations across Time and Space* (Human–Environment Interactions, v, Cham, Switzerland, 2016).

[16] Bruno Latour, *Reassembling the Social: An Introduction to Actor-Network-Theory* (Oxford, 2005); and for a recent overview of relevant literature, Martin Müller, 'Assemblages and Actor-networks: Rethinking Socio-material Power, Politics and Space', *Geography Compass,* ix, 1 (2015), 27–41.

[17] Donna Haraway, 'Anthropocene, Capitalocene, Plantationocene, Chthulucene: Making Kin', *Environmental Humanities,* vi (2015), 160–1; see also Bruno Latour's recent use of the notion 'Gaia' to encompass the new society–nature configuration of the 'Anthropocene': Bruno Latour, *Facing Gaia: Eight Lectures on the New Climatic Regime* (Cambridge, 2017). I am grateful to Greet De Block, University of Antwerp for drawing my attention to this work.

[18] Compare the critical perspectives on resilience in urban political ecology by Maria Kaika, '"Don't Call me Resilient Again!": The New Urban Agenda as Immunology . . . or . . . What Happens when Communities Refuse to be Vaccinated with "Smart Cities" and Indicators', *Environment and Urbanization,* xxix, 1 (2017), 89–102; or Matthew Gandy, 'From Urban Ecology to Ecological Urbanism: An Ambiguous Trajectory', *Area*, xlvii, 2 (2015), 150–4.

the same time however, this transformation was also the result of specific human actions by well-defined human actors, who set out to instrumentalize the disaster in pursuit of their own objectives. For the Marques de Pombal and his collaborators the earthquake opened a unique 'window of opportunity' to implement rigorous — and often long-prepared — measures and changes. For the inhabitants of Lisbon the experience of the disaster might have been quite different, depending on their position in society.[19] In the end, labelling a society — or socio-environmental system, or 'multispecies assemblage' — such as Portugal in 1755 vulnerable or resilient, is largely in the eye of the beholder (whether eye-witness or historian).[20]

This article therefore proposes an alternative and, to a certain extent, more simple way of studying vulnerability in the past: namely by bringing the victims back in. Rather than studying vulnerability and resilience at the level of societies or integrated socio-environmental systems, it identifies specific actors or groups within society who, through a combination of environmental and social processes, might be put at risk, either physically, in their material assets, or in the organization of their livelihoods. In disaster studies, the latter approach is usually associated with the work of social geographers such as Ben Wisner or Piers Blaikie, and the Latin-American *RED de Estudios Sociales en Prevención de Desastres*. Spurred by the African Sahel Droughts of the 1970s, social scientists started to react against the hitherto predominantly technological approach to disasters as well as the presumed 'naturalness' of natural disasters. It was not natural variability, but global inequality — and the underdevelopment of the Third World — that turned natural hazards into disasters.[21] While the equation of

[19] Alvaro S. Pereira, 'The Opportunity of a Disaster: The Economic Impact of the 1755 Lisbon Earthquake', *Journal of Economic History*, lxix, 2 (2009).

[20] Gregory Bankoff, 'Rendering the World Unsafe: "Vulnerability" as Western Discourse', *Disasters*, xxv, 1 (2001); contemporary observers of disaster could conceive competing narratives of resilience and vulnerability, see Raingard Esser, '"Ofter gheen water op en hadde gheweest": Narratives of Resilience on the Dutch Coast in the Seventeenth Century', *Dutch Crossing: Journal of Low Countries Studies*, xl, 2 (2016).

[21] Piers Blaikie *et al.*, *At Risk: Natural Hazards, People's Vulnerability and Disasters* (London, 1994); building on twenty years of research starting with Phil O'Keefe, Ken Westgate and Ben Wisner, 'Taking the Naturalness out of Natural Disasters', *Nature*, cclx, (15 April 1976); Andrew Maskrey (ed.), *Los desastres no son naturales* (La RED, 1993).

vulnerability with poverty might be considered reductionist,[22] the basic research question of Wisner and Blaikie — who suffers and why? — still offers a valuable starting point for an alternative reading of vulnerability to natural hazards and disasters in history. With the possible exception of plague and human epidemics, there has been surprisingly little research on the victims of nature-induced hazards and disasters in the pre-modern past, leaving ample room for unverifiable statements on both the number of casualties and their social profile.[23] In what follows, I will illustrate this by focusing on one specific type of natural hazard in a coherent geographical space: coastal floods following storm surges in different parts of the North Sea area. Following an introduction of the hazard (storms and storm flooding) and the area, the article investigates whether vulnerability and resilience should be searched for at the aggregate level of coastal societies (and their economic, environmental, social or political organization), or rather can be retraced to specific groups in specific situations.

II

COASTAL FLOODS IN THE NORTH SEA AREA

The North Sea area (see Map) has a long history of coastal floods induced by storm surges, from the legendary flood in Frisia in 838 to the modern disasters of 1953 and 1962 that killed respectively about 1800 people in the Netherlands and about 350 in the north-German Elbe estuary. For more than a thousand years living with the permanent risk of flooding has been a dominant feature of North Sea society.[24] Storm surges are a typical example of

[22] Joan Martinez-Alier, *The Environmentalism of the Poor: A Study of Ecological Conflicts and Valuation* (Cheltenham, 2002).

[23] On the neglect of disaster victims in historical research, see Gregory Clancey, 'The Changing Character of Disaster Victimhood: Evidence from Japan's "Great Earthquakes"', *Critical Asian Studies*, xlviii (2016), 356–8. Compare the obvious inaccuracy of the death tolls caused by different natural disasters, as cited on the internet, for instance: <https://en.wikipedia.org/wiki/List_of_natural_disasters_by_death_toll> (accessed 29 August 2017).

[24] Greg Bankoff, 'The "English Lowlands" and the North Sea Basin System: A History of Shared Risk', *Environment and History*, xix, 1 (2013); Franz Mauelshagen, 'Flood Disasters and Political Culture at the German North Sea Coast: A Long-term Historical Perspective', *Historical Social Research*, xxxii, 3 (2007); James Galloway, 'Storm Flooding, Coastal Defence and Land Use around the Thames Estuary and Tidal River *c.*1250–1450', *Journal of Medieval History*, xxxv, 2 (2009).

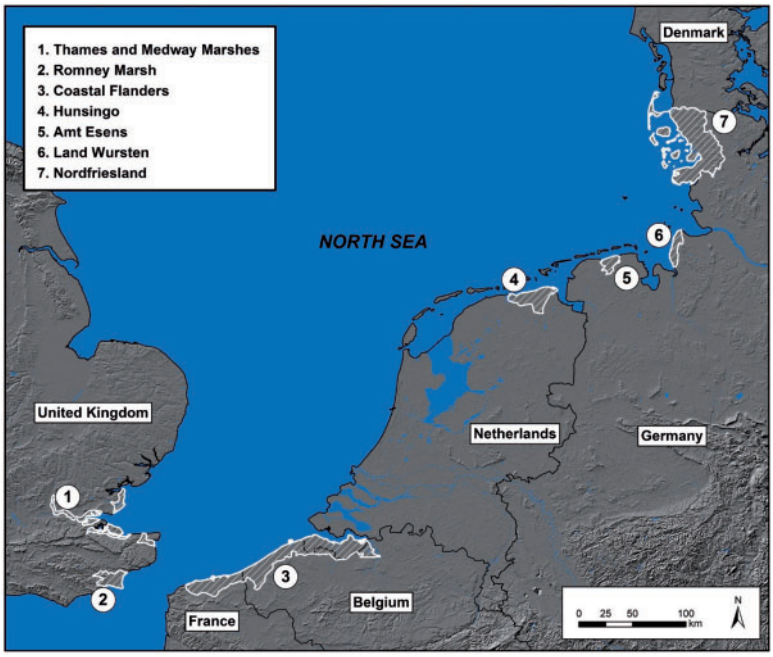
'extreme weather' — a conjunction of a powerful storm and high water levels (often a spring tide). The stormy weather itself might be fuelled by broader fluctuations in global atmospheric conditions. As such, climatic drivers, in combination with the environmental dynamics of the coastal lowlands, might explain why storm surges occurred in the North Sea area. More difficult is the question of whether or not some periods experienced more storms than others. Reliable instrumental measurements on wind speed are only available from the nineteenth century onwards and mostly indicate considerable inter-annual to multi-decadal variability, in which periods of more frequent storms, for instance in the late nineteenth and the late twentieth century, alternate with periods of significantly greater calm, such as the 1960s and 1970s, without exhibiting consistent long-term trends.[25] Reconstruction of storminess in a more distant past is complicated, since most available proxies would record the impact (damage) rather than the actual strength of the storm.[26] Using historical, documentary proxies, Adriaan de Kraker has attempted to reconstruct storminess along the Flemish and Zeeland coast for the period 1390–1725. From this analysis, De Kraker derived nine periods of intensified storminess, but once again without any long-term pattern of increasing or decreasing storm activity.[27]

Thus, while extreme storms occurred in the North Sea, while some of these storms were more extreme than others, and while some decades experienced more severe storms than others, the degree of storminess of the North Sea tells us very little about the occurrence of flood *disasters.* A storm surge only turns into a catastrophe when there is social interference, in our example, both in the way the coastal lowlands were organized, in terms of settlements and land-use and in the coping and relief mechanisms

[25] Sönke Dangendorf *et al.*, 'North Sea Storminess from a Novel Storm Surge Record since AD 1843', *Journal of Climate*, xxvii, 10 (2014); Ü Suursaar, J. Jaagus and H. Tõnisson, 'How to Quantify Long-term Changes in Coastal Sea Storminess?', *Estuarine, Coastal and Shelf Science,* clvi (5 April 2015).

[26] Studies of inland sea-salt deposits in ice cores and sand deposits in peat bogs — both resulting from storm wind — might yield new information in the near future: Lisa C. Orme, *et al.*, 'Aeolian Sediment Reconstructions from the Scottish Outer Hebrides: Late Holocene Storminess and the Role of the North Atlantic Oscillation', *Quarternary Science Reviews*, cxxxii (2016).

[27] Adriaan de Kraker, 'Storminess in the Low Countries, 1390–1725', *Environment and History,* xix, 2 (2013).



THE NORTH SEA AREA WITH SOME OF THE PLACES MENTIONED IN THE TEXT (map by Iason Jongepier, GIStorical Antwerp).

deployed. If humans had not built sea walls, sea walls could not have been breached by storm surges, and the storm surge would not have turned into a disaster. Or, as Scott Gabriel Knowles, puts it, 'It is the manufacture of "second nature" — technological systems at the interface of water and land . . . — that creates the context of modern disaster'.[28] In the coastal wetlands of the North Sea area such technological systems, combining the construction of sea walls and drainage systems, appeared around 1000 AD. Before that period, most settlements were situated on higher ground — the *terpen*, *Warften* and *Wurten* — which were partially natural and partially artificial elevations in the coastal landscape. After 1000 AD, a 'Great Transformation'

[28] Scott Gabriel Knowles, 'Learning from Disaster?: The History of Technology and the Future of Disaster Research', *Technology and Culture*, lv, 4 (2014), 775.

set in, in which coastal marshes were reclaimed and permanently protected by sea walls, enabling a more intensified land-use and the spreading of settlements.[29] The first more or less reliable reports on flood disasters followed shortly afterwards — in Flanders, for instance, in 1014 and 1042. In contrast to North Sea storms, the pattern of North Sea flood disasters presents some remarkable clusters in time and space: Flanders, Zeeland and southern England seem to have been particularly hit by flood disasters in the later Middle Ages, while escaping the worst consequences of storm flooding in the seventeenth and eighteenth centuries. The opposite seems true for the Wadden Sea area in the north of the Dutch Republic and northern Germany.[30] We should therefore investigate why particular regions proved so vulnerable to floods, and how the features and causes of these vulnerabilities might be evaluated.

III

THE ABSENCE OF COLLAPSE: COASTAL SOCIETIES BOUNCING BACK AFTER FLOOD DISASTERS

From the framework of systemic vulnerability and resilience elaborated above, it can be derived that a coastal society — or socio-environmental system — can only be labelled vulnerable if the disturbance caused by a flood cannot be countered through absorption, or adaptation or transformation. If a society showed rapid recovery after a flood, either without structural changes or

[29] Stephen Rippon, *The Transformation of Coastal Wetlands: Exploitation and Management of Marshland Landscapes in North West Europe during the Roman and Medieval Periods* (Oxford, 2000); Erik Thoen *et al.*, *Landscapes or Seascapes?: The History of the Coastal Environment in the North Sea Area Reconsidered* (Turnhout, 2013).

[30] For Flanders, see Tim Soens, 'Floods and Money: Funding Drainage and Flood Control in Coastal Flanders from the Thirteenth to the Sixteenth Centuries', *Continuity and Change*, xxvi, 3 (2011). For the Dollard region in Groningen/Oost-Friesland, Otto Knottnerus was able to demonstrate that many alleged late-medieval flood disasters (1277, 1287, 1362, etc.) either did not affect the region or turned out to be complete myths: Otto S. Knottnerus, 'Reclamations and Submerged Lands in the Ems River Estuary (900–1500), in Thoen *et al.*, *Landscapes or Seascapes?*; see also Martin Rheinheimer, 'Mythos Sturmflut: Der Kamp gegen das Meer und die Suche nach Identität', *Demokratische Geschichte*, xv (2003). Regional studies of flood disaster have to complement and correct the more general compilations by M. K. Elisabeth Gottschalk, *Storm Surges and River Floods in the Netherlands*, 3 vols. (Assen, 1971–7); Jan Buisman, *Duizend jaar weer, wind en water in de Lage Landen*, 6 vols. (Franeker, 1995–2015); Hubert Lamb, *Historic Storms of the North Sea, British Isles and Northwest Europe* (Cambridge, 1991).

with changes that increased its capacity to cope with future floods, the society could be deemed resilient. In order to analyse resilience at the aggregate level of societies, different configurations or 'types' of societies have been distinguished, based, for instance, on environmental features, market integration or the social distribution of power and property.[31] Within the coastal North Sea area as well, different configurations can be discerned, depending on the predominance of short-term leasehold farming and the influence of feudal lords and territorial overlords, but also on the quantity of peat in the subsoil or the quality of drainage.[32] It is argued here, however, that *all* these societies can be deemed successful in coping with flood disasters, in the sense that flood disasters were not followed by any sign of collapse whatsoever. Moreover coastal societies overcame the flood disaster mainly through absorption of the disturbance it had caused — at least if the flooding did not coincide with a major episode of open warfare.[33] So, whether looking at economic development, institutional organization or the human interaction with the coastal and estuarine environment, floods tended to be followed by rapid recovery and a remarkable continuity.

This might seem rather at odds with the conclusion of Mark Bailey, who in a pioneering article on the economic impact of pre-modern flood disasters, has argued that repeated coastal flooding did contribute to a stagnation and decline in agricultural

[31] Daniel R. Curtis, *Coping with Crisis: The Resilience and Vulnerability of Pre-Industrial Settlements* (Farnham, 2014), 23–35; Maïka De Keyzer, 'All We Are is Dust in the Wind: The Social Causes of a "Subculture of Coping" in the Late Medieval Coversand Belt', *Journal for the History of Environment and Society*, i (2016), 1–35.

[32] See Erik Thoen, '"Social Agrosystems" as an Economic Concept to Explain Regional Differences: An Essay Taking the Former County of Flanders as an Example (Middle Ages–19th Century)', in Bas J. P. van Bavel and Peter Hoppenbrouwers (eds.), *Landholding and Land Transfer in the North Sea Area (Late Middle Ages–19th Century)* (Turnhout, 2004), 47–66; Bas van Bavel, *Manors and Markets: Economy and Society in the Low Countries, 500– 1600* (Oxford, 2010), 5–21; Otto Knottnerus, 'Yeomen and Farmers in the Wadden Sea Coastal Marshes, *c*.1500–*c*.1900', in van Bavel and Hoppenbrouwers (eds.), *Landholding and Land Transfer in the North Sea Area*, 149–86. All authors stress that such configurations were invariably dynamic in space and time.

[33] On the impact of wartime floods: A. M. J. de Kraker, 'Flooding in River Mouths: Human Caused or Natural Events? Five Centuries of Flooding Events in the SW Netherlands, 1500–2000', *Hydrology and Earth System Sciences*, xix, 6 (2015).

output in southern England between 1280 and 1350.[34] His argument can apparently be underpinned by fiscal data showing the relative decline of English coastal marshes, which in the thirteenth and early fourteenth centuries belonged to the richest districts of England, but which by the sixteenth century yielded much less tax revenue per surface unit than neighbouring inland regions.[35] It is tempting to associate this relative decline of the coastal marshes in late-medieval England to increased flood problems.[36] For the marshlands of southern England — as for coastal Flanders — this view has recently been challenged, most notably by Mark Gardiner and Spencer Dimmock, who have both argued that the spectacular decline in population and the loss of entire villages occurred much later than often thought (*c.*1470–1530) and were not caused by catastrophic flooding (nor by the Black Death more than a century before). Although there certainly were serious flood events in the fourteenth and fifteenth centuries, and sometimes entire villages were flooded, this did not imply the end of the marshland communities. Instead flooded villages, including their churches, were carefully dismantled and relocated to higher ground. Before the sixteenth century, building materials were carefully recuperated and reused by their former inhabitants who were still living nearby.[37] More structural changes became visible from the late sixteenth century onwards, as the region turned into an area of extensive pasturing. This transformation, however, cannot be explained by catastrophic floods but rather

[34] Mark Bailey, '"Per impetum maris": Natural Disaster and Economic Decline in Eastern England, 1275–1350', in Bruce M. S. Campbell (ed.), *Before the Black Death: Essays in the 'Crisis' of the Early Fourteenth Century* (Manchester, 1991).

[35] See the declining fiscal wealth in coastal marshlands in England, as revealed by the Lay Subsidies of 1334 and 1524/5: Spencer Dimmock, *The Origin of Capitalism in England, 1400–1600* (Leiden, 2014), 238; and John Sheail, *The Regional Distribution of Wealth in England as Indicated in the 1524/5 Lay Subsidy Returns*, ed. Richard Hoyle, 2 vols. (London, 1998), i, 107.

[36] Mavis E. Mate, *Trade and Economic Developments 1450–1550: The Experience of Kent, Surrey and Sussex*, (Woodbridge, 2006), 169ff.

[37] Mark Gardiner, 'Settlement Change on Denge and Walland Marshes, 1400–1550', in Jill Eddison, Mark Gardiner and Antony Long (eds.), *Romney Marsh: Environmental Change and Human Occupation in a Coastal Lowland* (Oxford University Committee for Archaeology Monograph xlvi, 1998), 130–2; Dimmock, *The Origin of Capitalism in England,* 240–2. Compare the dismantling and relocation of flooded villages in coastal Flanders: Nele Vanslembrouck, Alexander Lehouck and Erik Thoen, 'Past Landscapes and Present-Day Techniques: Reconstructing Submerged Medieval Landscapes in the Western Part of Sealand Flanders', *Landscape History*, xxvii (2005).

by long-term processes of consolidation of landholding, engrossment of holdings, the declining autonomy of the village communities, the fiscal burdens of warfare and so on.

In other words, the potential for flood disasters to force economic change should not be overestimated. Floods — even the largest ones — were localized events, which did not affect entire economic regions. Unlike the Great Famine of 1315–17,[38] for instance, there is no sign whatsoever that even the worst flood disaster caused disintegration of agricultural markets, either in the fourteenth or in the eighteenth centuries.[39] The few long-term reconstructions of agricultural output in coastal regions also indicate that 'bouncing back' was the predominant answer of coastal economies to flood disasters. For the coastal village of Heist in Flanders, tithe receipts (of cereals) can be followed from the 1280s to the end of the eighteenth century. In this coastal region a structural decline of cereal production can be noticed, starting well before the Black Death. Floods, on the other hand, probably caused a drop in tithe receipts in eleven years (1391 being the first flood visible in the series, 1714–15 the last one, see Figure).[40] Three flood episodes — 1404, 1421/24 and 1509/11 — even led to a significant reduction in tithe profits which lasted for more than one year. However, these major floods were followed by rapid recovery, and this is also true for other types of nature-induced hazards such as harvest failures or even the Black Death. In this region cereal production boomed in the early 1350s. The only type of hazard which really disturbed agricultural output was warfare: major periods of (civil) war as in 1379–85; 1475–92; 1570–85 and 1601–4 had a much more lasting impact on tithe receipts. Wars not only affected more people and larger areas for longer periods of time, they also tended to bring destruction of capital goods, which might not be the case during a flood (see below) or a famine.[41]

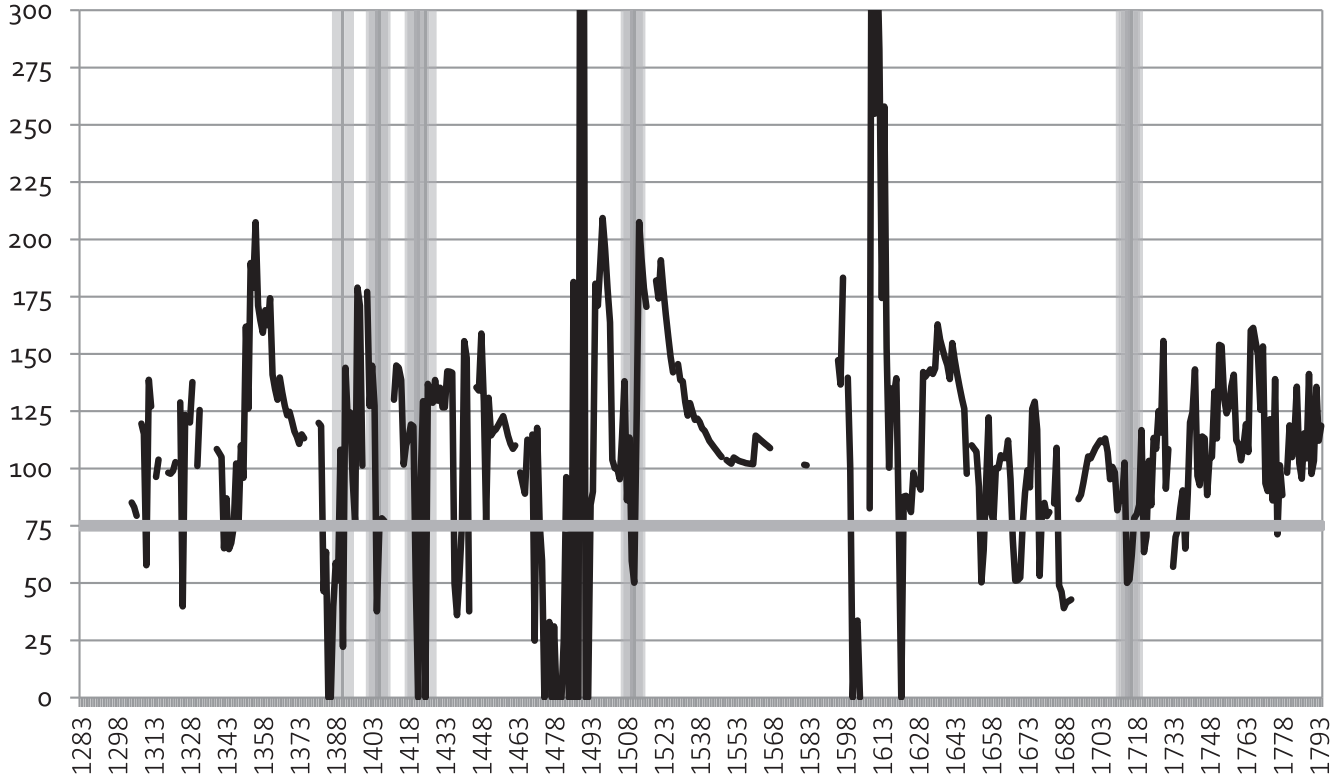
[38] Philip Slavin, 'Market Failure during the Great Famine in England and Wales (1315–1317)' *Past and Present*, no. 222 (Feb. 2014).

[39] See the price series for cereals for coastal Flanders by A. E. Verhulst, 'Prices of the Sint-Donatiaanskapittel in Brugge, 1348–1800', <http://www.iisg.nl/hpw/data.php>; and for Groningen by W. Tijms, *Groninger Graanprijzen: De prijzen van agrarische producten tussen 1546 en 1990* (Historia Agriculturae, xxxi, Groningen, 2000).

[40] We only considered drops of more than 25 per cent compared to a twenty-year moving average.

[41] Myron P. Gutmann, *War and Rural Life in the Early Modern Low Countries* (Princeton, 1980); and for contemporary societies, see Eduardo Cavallo *et al.*,

(cont. on p. 157)



DISTURBANCE OF CEREAL PRODUCTION IN THE COASTAL PARISH OF HEIST, FLANDERS (1284–1793), BASED UPON TITHE RECEIPTS IN CASH COLLECTED BY THE BRUGES HOSPITAL OF ST JOHN*

* Source: Calculations by the author, based on Kristof Dombrecht, *Plattelandsgemeenschappen, lokale elites en ongelijkheid in het Vlaamse kustgebied, 14de–16de eeuw* (Gent, 2014), 401–2.

Note: The receipt of the current year is calculated as a percentage of the average receipt in the twenty preceding years. Grey bars indicate a drop in tithe receipts parallel with a confirmed coastal flood.

While absorption prevailed, in some contexts signs of economic adaptation are visible (even though it is difficult to say whether these should be considered as the direct impact of floods, or of these floods being instrumentalized by economic actors to accelerate changes which would have happened regardless). In the 1370s, the English abbey of Barking was confronted with major flooding on its central manor near the Thames estuary. Originally, the reaction was robust and considerable amounts of money were spent to repair the sea walls, helped by tax exemptions and the issuing of commissions *de wallis et fossatis* by the English Crown (aimed at co-ordinating the repair works). However, by the 1380s James Galloway detected a clear change in the abbey's policy: investments came to an end and the flooding of large stretches of marsh was no longer countered. Instead the abbey started to organize fisheries and the exploitation of saltmarsh resources. No further commissions were issued by the Crown for this area. Does this indicate the final breakdown of a coastal society collapsing due to increased pressure from the sea? Not really, for from the point of view of the abbey this was a 'pragmatic' and 'entirely rational' accommodation to changed socio-economic and environmental realities, including the social breakdown of the coastal peasantry in the wake of the Peasants' Revolt of 1381.[42] Of course, the abbey's new policy brought severe dislocation for many of its tenants and other inhabitants of the Barking marshes, but from a systemic point of view, the changing strategy of coping was a sign of resilience rather than vulnerability.

In the early modern period too, even the worst flood catastrophe seldom brought real economic breakdown.[43] The devastating Wadden Sea floods of the seventeenth and early eighteenth

(n. 41 cont.)
'Catastrophic Natural Disasters and Economic Growth', *Review of Economics and Statistics*, xcv, 5 (2013).

[42] James A. Galloway, '"Tempests of Weather and Great Abundance of Water": The Flooding of the Barking Marshes in the Later Middle Ages', in Matthew Davies and James A. Galloway (eds.), *London and Beyond; Essays in Honour of Derek Keene* (London, 2012), 78–83. Compare, on the highly responsive estate management of the abbey of Ely, David Stone, *Decision-making in Medieval Agriculture* (Oxford, 2005). A similar transition from high-investment policies to minimal spending was observed for coastal Flanders, shortly after 1420: see Soens, *Floods and Money*, 338–40.

[43] In Zeeland–Flanders, for instance, the impact of the 1714 and 1715 floods on the export of cereals was minimal: P. J. van Cruyningen, *Behoudend maar buigzaam: Boeren in West-Zeeuws-Vlaanderen 1650–1850* (Wageningen, 2000), 412–14.

centuries, which will be discussed in detail in section IV below, killed thousands of people and dislocated thousands of others, but the coastal economy was not critically endangered by the floods. For sure, the coastal economy of the northern Netherlands and northern Germany performed very badly in this period, and in Groningen, for instance, land prices reached a secular low just after the Christmas flood of 1717.[44] Furthermore, Manfred Jakubowski-Tiessen observed for neighbouring parts of Germany that landowning farmers saw their debts increase significantly. In some regions — although not everywhere — debts related to the Christmas flood would only be repaid in the late eighteenth century.[45] However, the coastal economy was already in dire straits decades before the floods, which at best proved a complicating factor, just like the outbreak of cattle plague, which more or less coincided with the Christmas flood.[46] The structural characteristics of the coastal economy did not change because of the flood. Even engrossment of farms in the wake of the flood disaster remained in the end rather limited, as few landlords were interested in investing in regions liable to flooding in a period of agrarian depression. Certainly, several big farmers went bankrupt, but they were replaced by others. Only after 1750 did the coastal economy of the northern marshlands go through a period of structural transformation and growth, when the marshlands were converted into an extremely polarized but economically prosperous 'grain republic' dominated by wealthy farmers, but the flood disaster of 1717 plays no role in the explanation of the economic success story of the coastal marshlands in this period.[47]

[44] Peter R. Priester, *De economische ontwikkeling van de landbouw in Groningen 1800–1910: een kwalitatieve en kwantitatieve analyse* (Wageningen, 1991), 120–1; M. Knibbe, 'Pachtprijzen in Friesland 1712–1912', *Tijdschrift voor sociaalwetenschappelijk onderzoek van de landbouw*, iv (1989).

[45] Manfred Jakubowski-Tiessen, *Sturmflut 1717: Die Bewältigung einer Naturkatastrophe in der Frühen Neuzeit* (Munich, 1992), 198–200.

[46] For the relationship with cattle plague, see Adam David Sundberg, *Floods, Worms and Cattle Plague: Nature-induced Disaster at the Closing of the Dutch Golden Age, 1672–1764* (Univ. of Kansas Ph.D. thesis, 2015).

[47] The remarkable economic expansion of the coastal marshlands in the latter half of the eighteenth century is analysed by Priester, *De economische ontwikkeling van de landbouw in Groningen*; and Richard Paping, '*Voor een handvol stuivers': werken, verdienen en besteden: de levensstandaard van boeren, arbeiders en middenstanders op de Groninger klei*, 1770–1860 (Groningen, 1995). The polarization process is analysed by Curtis, *Coping with Crisis*, 181–222.

Similar stories of absorption complemented by adaptation could be told from an institutional, social and environmental perspective. For the most part, pre-industrial flood disasters did not bring major institutional changes in the way flood protection, insurance strategies or village politics were organized. Around 1700, for instance, the traditional maintenance of flood protection by means of the allotment of sea walls to individual farmers was increasingly questioned by supra-local authorities searching to expand their grip on coastal environments and communities. In such a context, flood disasters were eagerly reclaimed to prove the failure of traditional coping mechanisms. As the saying goes, 'never waste a good crisis'.[48] As similar changes also occurred in regions which did not experience flood disasters, and as many flood-affected regions did not see institutional change, we can hardly speak of an institutional innovation cycle driven by disaster. Absorption and continuity also predominated in social relations. Most flood disasters did not bring major reconfigurations of landholding or landed property. In the wake of the 1717 Christmas flood — the most deadly flood in the history of the North Sea area — various bankrupt tenant farmers were replaced by new ones, and landless labourers managed to acquire pieces of land previously owned by peasants killed in the flood, but evidence for real engrossment is limited.[49] However, in places that were already prone to either engrossment or fragmentation of landholding, a flood might accelerate this evolution. This was the case, for instance, in thirteenth- and fourteenth-century Flanders, where

[48] See Milja van Tielhof, 'Forced Solidarity: Maintenance of Coastal Defences along the North Sea Coast in the Early Modern Period', *Environment and History*, xxi, 3 (2015), 345; Sundberg, *Floods, Worms and Cattle Plague.* Compare Richard J. Samuels, *3.11: Disaster and Change in Japan* (Ithaca, 2013) for an in-depth analysis of the rhetoric of crisis and need for institutional change following the Fukushima nuclear disaster. Qing Miao and David Popp offer an example of the innovation-spurred-by-disaster thesis in 'Necessity as the Mother of Invention: Innovative Responses to Natural Disasters', *Journal of Environmental Economics and Management*, lxviii, 2 (2014).

[49] Jakubowski-Tiessen, *Sturmflut 1717*, 198–200. In a sample of 111 so-called *Kloostermeiers* (big tenant farmers of former monastic land) in the heavily affected Hunsingo district in Groningen, we found only one example of engrossment following the 1717 flood: in 1719 Rinje and Frauke Halsema, tenants of the Freddema-house in Kloosterburen, enlarged their considerable holding of 75 hectares with the land of Jacob Jurjens (27 hectares). In 1722, a further extension followed, with the land of Clais Hindric (42 hectares). Halsema thus became by far the largest farmer in our sample (Groninger Archieven, Staten van Stad en Lande, 2512–6).

monastic landholders managed to acquire thousands of hectares of flooded peasant land in the wake of the 1288 and 1334 floods.[50] Finally, from an environmental point of view, the capacity of an estuarine or coastal ecosystem to absorb floods depends to a large extent on the available space to accommodate excess flood waters. Present-day flood protection programmes are to a large extent aimed at increasing this overflow space through coastal realignment or the construction of 'controlled' inundation areas.[51] From such a perspective, dike breaches, and even the abandoning of land to the sea or the estuary, can be deemed highly resilient adaptations as they increased the available space for absorption.

In short, coastal societies never showed signs of collapse as the result of a flood disaster. They invariably managed to overcome these disasters through absorption and adaptation. The basic social and ecological features of the society in question either continued to function along pre-disaster lines or dynamically adapted to new conditions. Floods, however, could be a hugely traumatic and devastating experience at the level of individual households living in the coastal marshes. The resilience of society overall did not protect some of its individual members from extreme vulnerability.

IV

WHO SUFFERED AND WHY? IDENTIFYING THE VICTIMS

Medieval and early modern chroniclers were fascinated by floods and left us with a huge number of flood reports, which have since been compiled in gazetteers.[52] They often speak of 'large' numbers of victims and 'huge' amounts of material damage. Especially when discussing floods in the distant past or in distant regions, they often mention spectacular numbers of people allegedly killed in the disaster. According to Johannes

[50] Tim Soens, 'The Social Distribution of Land and Flood Risk along the North Sea Coast: Flanders, Holland and Romney Marsh compared (*c.*1200–1750)', in Bas van Bavel and Erik Thoen (eds.), *Property Rights, Society and Sustainable Use of Land in Fragile and Marginal Environments (Late Middle Ages–20th Century)* (Turnhout, 2013), 141–74.

[51] Stijn Temmerman and Matthew L. Kirwan, 'Building Land with a Rising Sea', *Science*, cccxlix (7 Aug. 2015), 588–9.

[52] See n. 30, above.

Hoyer, writing in the seventeenth century, two hundred thousand people were killed in northern Germany by the flood of 1362. In 1666, Antonius Heimreich — who gives reliable information on the Burchardi flood of 1634 — mentions four hundred thousand deaths for the All Saints' flood of 1570. [53] It goes without saying that such claims are utter nonsense, as they exceed by far the total population living in these coastal areas at the time. There are good reasons to assume that many flood disasters, especially in the medieval period, were *not* particularly deadly. In many medieval lowlands floods remained a 'frequent life experience',[54] one to which the inhabitants were accustomed, and one for which they were prepared. Already in the twelfth century, *Saxo Grammaticus* considered the repeated flooding as something which had both advantages (the deposit of sediments) and disadvantages (erosion and damage to people and property).[55] In the sixteenth century high tides overflowing the sea walls in the coastal marshes along the Schleswig coast were still considered part of everyday life. After a flood, the flood water could be evacuated through the normal drainage system. As Martin Rheinheimer argued, these 'amphibious' practices were lost from the second half of the fifteenth century onwards. New types of sea walls were built which, just like their counterparts in the southern North Sea area, offered a more permanent type of flood protection, allowing settlements to leave the *Warften*.[56]

Thus, claiming many victims was not a universal characteristic of flood disasters in the North Sea area. High numbers of casualties were limited to specific floods in very specific conditions and, as shown below, these floods also killed specific groups of people. Jan Buisman recently compiled the available evidence on the number of fatalities caused by flood disasters in the Dutch Republic. He concluded that since 1570 only four

[53] Rheinheimer, 'Mythos Sturmflut', 30.

[54] Bankoff, '"English Lowlands" and the North Sea Basin System', 19.

[55] Dirk Meier, Hans Joachim Kühn and Guus J. Borger, *Der Küstenatlas: Das Schleswig-Holsteinische Wattenmeer in Vervangenheit und Gegenwart* (Heide, 2013), 75–6, trans. A. Panten. The practice described reminds one of the periodic warping of marshlands as a technique of fertilization: see Thomas M. Smith, 'Warping and parliamentary enclosure: the example of north-west Lindsey, Lincolnshire', *Agricultural History Review,* lxii (2014).

[56] Rheinheimer, 'Mythos Sturmflut', 19–21, based on Albert Bantelmann, 'Die Landschaftsentwicklung an der Schleswig-holsteinischen Westküste, dargestellt am Beispiel Nordfriesland: Eine Funktionschronik durch fünf Jahrtausende, *Die Küste*, xiv, 2 (1966), 89.

TABLE 1

MOST DEADLY FLOOD DISASTERS IN THE HISTORY OF THE NETHERLANDS*

Year	1570	1717	1686	1953	1825	1682
Victims	6,000?	2,426	*c.*1,900	1,836	*c.*380	<100

* Source: based on Jan Buisman, *Duizend jaar weer, wind en water in de Lage Landen*, 6 vols., vi (Franeker, 2015), 980–1.

floods have definitely killed more than one thousand people: those of 1570, 1686, 1717 and 1953 (see Table 1).

Based on our analysis, these four flood disasters — together with the Burchardi flood of 1634, which mainly affected the coast of Schleswig and Denmark but spared the Dutch Republic — were the most deadly in the entire human history of the North Sea area, while the Christmas flood of 1717 stands out as the most lethal of these, claiming between 11,399 and 13,352 lives.[57] Furthermore, before 1800, all of these deadly catastrophes were concentrated in one very particular area of the North Sea: the Wadden Sea, from Friesland in the Dutch Republic to the west coast of Denmark. Within the Wadden Sea area certain districts proved particularly vulnerable: the Groningen district of Hunsingo, for instance, suffered 640 deaths in 1686 and 1,942 deaths in 1717. A striking contrast can be observed between these deadly Wadden Sea floods and the more limited number of people killed by flood disasters in other parts of the North Sea area in the same period. The 1682 flood, which mainly affected the south-western Netherlands, offers a good example. Whereas non-local sources such as the *'loopende nieuwe maaren'* published in Utrecht mention high numbers of fatalities — 600 people killed near Hulst! — more accurate local sources mention about 70 people killed at different spots on the Zeeland islands. The maximum number of people killed in any one spot was 30 in or near the Zeeland town of Veere — most of them described as 'poor' or 'labourer'.[58] Similar or even lower numbers of fatalities characterize early modern floods

[57] Estimates by Jakubowski-Tiessen, *Sturmflut 1717,* 270–84, and Buisman, *Duizend jaar weer, wind en water,* respectively, based on detailed assessments per household by parish vicars; see also Sundberg, *Floods, Worms and Cattle Plague*, 24–5.

[58] Gottschalk, *Storm Surges and River Floods in the Netherlands,* iii, 297ff.

TABLE 2

RELATIVE CASUALTIES (PEOPLE AND CATTLE) IN ESENS (EAST-FRISIA) AFTER THE 1570 FLOOD*

Size of tenants (cattle units)	Cattle units	Households with fatal casualties (%)	% destroyed houses	% dead cattle units
Lowest quartile	0–2	54.4	81.6	73.2
Second quartile	3–11	40.6	61.7	76.9
Third quartile	12–33	28.8	33.6	59.3
Upper quartile	34–119	4.7	7	49.3
Total		32.1	46	54.2

* Source: Based on H. Homeier, 'Die Allerheiligenflut von 1570 in Ostfriesland', in Klaas de Vries and Jan P. Winsemius, *De Allerheiligenvloed van 1570* (Fryske Academy Publications, ccclxxxv, Leeuwarden, 1970), 67–9.

in England, from the Bristol Channel flood of 1607 to the Boston flood of 1810.[59]

In order to understand why Wadden Sea floods in the early modern period were so much more deadly, we have to start by identifying the victims. For three of the catastrophic Wadden Sea floods, detailed lists of victims have been preserved, which in two cases can be linked to data on wealth or farm size. As such they allow a unique insight into the social profile of the flood victims. The first case concerns the district or *Amt* Esens in East Frisia (Lower Saxony) during the All Saints' flood of 1570. In 1570 Esens was already a community consisting of large farms, with 84 per cent of the land concentrated in farms of over 20 hectares. Their occupiers were not tenant farmers, but rather landowning yeomen, who had a voice in representative organizations.[60] When linking the damage suffered by individual households to the number of cattle owned, a clear social bias becomes visible (see Table 2). The larger farmers were seldom killed and their houses were seldom destroyed, the two obviously being linked to each

[59] According to a pamphlet by vicar Samuel Partridge from May 1811, three people were killed by the flood: a poor woman of Kirton, 83 years old, washed out of her bed, a young woman of Fosdyke, who was milking cows and perished through a dike breach in a nearby sea wall, and a young man of Fishtoft, who died when trying to save his father's sheep: Anon., 'Boston Inundation 1810', *Fenland Notes and Queries* (Jan. 1905), 145. For the Bristol Channel flood of 1607, the usually cited numbers of 500 to 2,000 dead are unverifiable, and most probably hugely exaggerated (*contra* popularizing works such as Mike Hall, *The Severn Tsunami?: The Story of Britain's Greatest Natural Disaster* (Stroud, 2013)).

[60] Knottnerus, 'Yeomen and Farmers in the Wadden Sea Coastal Marshes', 156–8.

other. Most of the victims were clearly smallholders and/or agricultural labourers, who also saw most of their houses destroyed and a larger percentage of their cattle killed.

For 1634, Anton Heimreich, vicar on the island of Strand, reproduced a damage assessment that was probably compiled by the local representative of the duke of Schleswig-Holstein (the *Staller*). Interestingly, he did not only list 6,034 deaths in nineteen parishes on the former island of Strand — which was largely abandoned after the flood — but also mentions the number of surviving households (436, hence about 2,180 people). If this list is correct, two thirds of the inhabitants of Strand were killed by the flood, which would be the highest mortality rate ever recorded in a storm-induced flood disaster.[61] Interestingly, Heimreich made a distinction in his report on the surviving households between farmers (*Hauswirte* or *Bohlsmanner*) and cottagers (*Kötener* or *Kätner*). Out of the 436 surviving households only 14 per cent (61) were cottagers.[62] It is highly unlikely that such a distribution mirrors pre-flood conditions, as the number of cottagers usually exceeds the number of farmers by far. In other words, most of the victims would have been cottagers, whereas most of the survivors were farmers.

Finally, the most detailed evidence concerns the parish of Uithuizermeeden in the Groningen district of Hunsingo. Both in 1686 and 1717, Hunsingo suffered extremely high numbers of casualties (642 and 1,942 respectively), and Uithuizermeeden was one of the most affected parishes, with respectively 313 and 209 people dead. The size of the 1717 population in Uithuizermeeden is not precisely known, but 174 households were listed in a detailed assessment of the damage. On this basis, a total population of around 1,000 people seems realistic[63] and the devastating effect of the flood becomes clear:

[61] Meier, Kühn and Borger, *Küstenatlas*, 105ff. It is impossible to verify the accuracy of the pre-flood population numbers cited by Heimreich. If true, they indicate a very densely populated coastal society.

[62] Author's calculation based on Meier, Kühn and Borger, *Küstenatlas,* 112. For one of the 19 villages (Osterwold), the number of surviving cottagers was missing, but as only 6 farmers' households survived, it was probably zero.

[63] As the 1721 fiscal census listed 148 landholding households, we assume that almost every household in 1717 — including those not holding land — suffered some form of damage. Population numbers are only available from 1795 onwards (1620 inhabitants), with 377 households in 1807. In the nineteenth century, a household size of 3 to 4 for labourers and 6 to 7 for farmers was usual (Paping, '*Voor een handvol stuivers*', 65; 315–22).

TABLE 3

VICTIMS OF THE 1717 CHRISTMAS FLOOD IN UITHUIZERMEDEN (GRONINGEN) AND CENSUS DATA (*VERPONDING*) FOR THE SAME VILLAGE IN 1721*

Households in 1717	Farm size in 1721 (hectares)[98]	Fatal casualties in 1717 (no.)	Cattle lost in 1717 (no.)	Destroyed houses in 1717 (no.)
13 households	0.4–3.7	2	18	4
17 households	3.7–14.6	27	86	14
27 households	14.6–25.1	11	162	18
29 households	25.1–90.3	6	290	14
88 households	absent in 1721 census	163	169	55
Total 174 households		209	725	105

*Source: Groninger Archieven, Staten van Stad en Lande, 1084 and 2146.

one out of three inhabitants in 1686 and one out of five in 1717 might have died in the flood. Per household, the assessment lists the number of people, cattle and horses killed as well as the damage to the houses. The results can be compared with a fiscal census (*verpondingslijst*) from 1721, which is basically for a land tax, based on land use and hence mirroring farm sizes.

As Table 3 shows, only half of the households in the 1717 list were still present in the 1721 list. The other half of the households, which had disappeared from the region by 1721, suffered most of the casualties (163 out of 209), though only minor losses of cattle. The contrast between people and cattle indicates that those who were killed in the flood did not own a lot of cattle. Among those households still present in the area four years after the flood, there are huge differences according to farm size. The large farmers of Uithuizermeeden — possessing more than 25 hectares of land each — suffered only minor losses of life and most of them (29 out of 37 households) were able to maintain themselves in the area, at least until 1721. The Christmas flood of 1717 killed only a few large farmers or members of their households. This is confirmed by the administration of the provincial *land*. Out of a sample of 111 *kloostermeiers* (see n. 49, above) holding on average 28 hectares of land in the Groninger district of Hunsingo, only one — Duirt Willems from Kloosterburen — was killed during the flood, and this was a rather atypical *kloostermeier*, because he only farmed 12.5

hectares of land.[64] On the other hand, the large farmers were also seriously affected by the flood. In Uithuizermeeden, they lost on average 10 head of cattle each. Compared to the big farmers, the smallholders and the lower middling groups — working fewer than 14.5 hectares of land — were those who faced the risk of actually dying in a storm flood. Important divergences existed between both groups in the way the survivors recovered from the flood. Only a minority of the smallholders living in Uithuizermeeden in 1721 (13 out of 37) also lived in the parish four years before. These 13 households did not suffer a lot of fatal casualties (only 2). In contrast the majority of smallholders of 1717 had simply disappeared by 1721. In other words, only the minority of smallholders who, by chance, were largely unaffected by the disaster, continued to live in Uithuizermeeden. Among the lower middling groups with 3.7 to 14.6 hectares, both residential continuity and fatalities were a lot higher, indicating that some households managed to maintain themselves in the parish, despite losing several members of their household.

In the three cases discussed above, the social bias in the profile of the victims is obvious. In all three cases, a substantial number of people proved extremely vulnerable to storm flooding, but this vulnerability was never a general feature of society as a whole. The upper layers of rural society seldom saw their lives threatened, although they could suffer severe economic damage. In contrast, the labourers and cottagers were highly exposed to the risk of dying in a flood disaster. Such extreme exposure of labourers and cottagers to floods was not a general feature of coastal societies: as shown above, many early modern flood disasters did not witness similar numbers of casualties. The question therefore is: why were so many people in the early modern Wadden Sea area at risk of dying in a flood disaster?

V

EXPLAINING VULNERABILITY: HOW PEOPLE WERE PUT AT RISK

In 1649 the famous Dutch engineer and land surveyor *Jan Adriaanszoon Leeghwater* published a chronicle in which he

[64] Groninger Archieven, Staten van Stad en Lande (1719), 2515. The 48 guilders he owed the provincial administration at the moment of his death could not be recovered, because he had 'lost everything'.

recounted his experience of the Burchardi flood of 1634 along the west coast of what is today Schleswig-Holstein in Germany. At the time, Leeghwater was overseeing the ambitious construction of a new dam — the *Bottschlosser Werk* — which would allow the reclamation of a vast amount of marshland in the *Dagebuller Bücht* on behalf of Friedrich III, Duke of Schleswig-Holstein-Gottorf. When the wind was reaching gale force and the waves pounded the sea walls, a servant urged Leeghwater to flee to his nearby house. Leeghwater declined the offer, because the servant's house was only situated five or six feet above surface level. Instead he returned to his own house, situated on a dike eleven feet above surface level. While in bed, he was alerted that his house would not hold, as the waves were overflowing the dike on which it stood. Leeghwater and his son fled to the *Herenhuis* — the house of the dike reeve, which also served as the local inn and gathering place for the absentee landlords when they visited the area. This house was larger and stronger, and though wood posts were bursting and part of the earth underneath the house was washed away, the house did not collapse. Leeghwater, his son, the dike reeve and about twenty refugees with him survived the flood (only to be chased the next day by a furious crowd of people accusing Leeghwater for his obvious failure in building strong sea walls).[65]

Leeghwater's story perfectly illustrates the first level of analysis in the so-called Pressure-and-Release (PAR) model developed by Wisner and Blaikie,[66] which aims to explain vulnerability to natural hazards. In this model, vulnerability is understood as a combination of a natural hazard with three other factors: firstly, unsafe conditions such as living in dangerous locations or in houses lacking adequate protection; secondly, dynamic pressures, such as periods of economic or political crisis, or rapid transition (for example, periods of rapid population

[65] Jan Adriaensz Leeghwater, *Een kleyne chronycke ende voorbereydinghe van de afkomste ende 't vergrooten van de dorpen van Graft ende Ryp: ende van meer verscheyden notable oude stucken ende gheschiedenissen* (Amsterdam, 1649), 32–4; see also Marie-Luisa Allemeyer, '*Kein land ohne Deich . . . !*': *Lebenswelten einer Küstengesellschaft in der Frühen Neuzeit* (Veröffentlichungen des Max-Planck-Instituts für Geschichte, ccxxii, Göttingen, 2006), 287–8 and 307–8; and Raingard Esser 'Ein sonderlich und erschröcklich Wasserflut: Desaster-Management in der Frühen Neuzeit, in Paul Münch (ed.), 'Erfahrung' als Kategorie der Frühneuzeitgeschichte, *Historische Zeitschrift*, xxxi, 217–227. 221 ff.

[66] Blaikie *et al.*, *At Risk*, 24.

growth, industrialization or urbanization); and thirdly, root causes, such as limited access to power, resources and 'structures' (for example, formal and informal networks of assistance and relief). The PAR model can be applied on a macro-level, investigating why some regions were more vulnerable than others, but also on the micro-level of individual communities, explaining why some families and individuals were more likely to survive than others.

In the Wadden Sea floods, the three levels of vulnerability are clearly visible. First of all, the victims faced unsafe living conditions. In Leeghwater's narrative, only the *Herenhuis* survived the flood. Even after the medieval shift in settlements, from elevated locations into the lowlands of the marsh, protected by sea walls (see Section II, above), important farms often continued to be built on elevated spots, probably both for reasons of status and safety. In the early modern period, this practice became less frequently observed in new embankment and drainage projects, and sometimes even major farms were constructed on low-lying locations. Most problematic, however, was the housing of agricultural labourers and smallholders: there are quite a few examples of *polders* where permanent or temporary houses for labourers were located next to sea walls — or even entrenched in the slope of the sea wall[67] — on land provided to them by the water board or the village authorities. Alternatively, they were housed by individual farmers on pieces of low-valued — and low-lying — land. For the coastal marshlands of Groningen, in which the parish of Uithuizermeeden discussed above is situated, the separation of living between the 'grand' farmhouses of the large farmers, which in the eighteenth and nineteenth centuries were to reach an almost aristocratic grandeur, and the clusters of worker's houses 'sinking in the mud' in marginal and low-lying hamlets has been clearly documented.[68] For people living in a 'marginal' location, the question often was not *whether* a disaster would occur but *when*. Living on higher ground did not provide absolute safety, as many old medieval terp villages also flooded in the Christmas flood of

[67] See also Meier, Kühn and Borger, *Küstenatlas*, 98–9; Klaus-Joachim Lorenzen-Schmidt, *Ländliche Familienstrukturen in der nordwestdeutschen Küstenregion, 1750–1870* (Engelbrechtse Wildnis, 1987), 174.

[68] Curtis, *Coping with Crisis,* 205–7.

1717.[69] However, living a few metres higher, on a location removed from the sea walls and in larger and stronger houses, might have made the difference between life and death.

Apart from living conditions, we should also take into account more 'dynamic pressures' which help to explain why some catastrophes were more deadly than others. The combination of natural hazards with warfare and economic depression — the two sometimes related — often proved fatal.[70] It can hardly be deemed a coincidence that the Burchardi flood of October 1634 that destroyed the Schleswig island of Strand occurred during a period when Nordfriesland was ravaged by the armies of the King of Denmark and the Duke of Schleswig-Holstein-Gottorf during the Eighty Years War.[71] At the time of the Christmas flood of 1717, many of the northern German principalities affected by the flood were heavily involved in the Great Nordic War. Furthermore, as discussed above, this 1717 flood disaster also coincided with a secular low in the agricultural economy. In the north of the Dutch Republic the economic recession that ended the Golden Age might have started later (only after 1650) but also lasted longer.[72] In turn, the low returns from land might have had a direct impact on the maintenance of sea walls as investments were postponed or cancelled.[73]

In the end, however, the root causes of vulnerability must be assessed: the underlying mechanisms that house people in unsafe locations, the introduction of types of land-use that increase the frequency or strength of a natural hazard, or the limits on the ability of people to secure their livelihoods. For the early modern Wadden Sea area there are clear indications of three such mechanisms: first of all, marginalization processes, both at the regional level and within village communities; secondly, the presence of a political elite that lacked accountability to most of

[69] Gottschalk, *Storm Surges and River Floods in the Netherlands,* iii, 379, argues against the opinion that damage would have been less on the medieval *terp* settlements.

[70] See also Philip Slavin, 'Warfare and Ecological Destruction in Early Fourteenth-Century British Isles', *Environmental History*, xix, 3 (2014); Bruce M. S. Campbell, 'Nature as Historical Protagonist: Environment and Society in Pre-Industrial England', *Economic History Review*, lxiii, 2 (2010), 290–2.

[71] Geschichte Nordfrieslands, 6 vols (Bredstedt, 2003–9), iii, Rolf Kuschert, *Nordfriesland in der frühen Neuzeit* (Nordfriisk Instituut, clxxxiv, 2007), 26–7.

[72] See n. 47, above.

[73] A similar link between land rents and investments in the flood protection system has been observed for late medieval Flanders: Soens, 'Floods and Money'.

the inhabitants; and thirdly, the rise of an economic system that induced a high-risk type of land-use.

From the sixteenth century onwards, most of the coastal marshes in the Wadden Sea area had witnessed an increasing social polarization combined with a disintegration of the traditionally strong and autonomous village communities (the *Frisonica Libertas*).[74] This evolution broadly coincided with the transition from a peasant economy to a capitalist farming system, which can be observed in other coastal marshes of the North Sea area as well. In the Wadden Sea area the transition to agrarian capitalism displayed both a specific chronology and several distinct features, such as the importance of hereditary leasehold (instead of short-term leasehold) and the leading role of farmers (rather than landlords) in preparing the ground for agrarian capitalism to take root. From the sixteenth century onwards, the numbers of crofters (*Kötter-Kätner*) and agricultural labourers with limited access to land was on the rise. In contrast to other coastal regions, land consolidation was not accompanied by migration: cottagers largely stayed in the coastal marshes. For the Wadden Sea marshes as a whole, Otto Knottnerus assessed the number of households holding fewer than five hectares of land at 50–60 per cent of all households around 1550, rising to 60–80 per cent in the second half of the seventeenth century and to 70–90 per cent in the eighteenth century.[75] On the other hand, before 1750 these cottagers could not yet rely on an economic symbiosis with a powerful group of successful tenant farmers. As argued by Daniel Curtis, the 'dual' economy of multi-tasking cottagers on the one hand and giant agricultural enterprises on the other would only take off in the latter half of the eighteenth century.[76]

[74] Oebele Vries, 'Frisonica libertas: Frisian Freedom as an Instance of Medieval Liberty', *Journal of Medieval History*, xli, 2 (2015); on the tradition of peasant revolts in this region between the twelfth and the fourteenth centuries, see Bas J. P. van Bavel, 'Rural Revolts and Structural Change in the Low Countries: Thirteenth–Early Fourteenth Centuries', in Richard Goddard, John Langdon, Miriam Müller (eds.), *Survival and Discord in Medieval Society: Essays in Honour of Christopher Dyer* (Turnhout, 2010).

[75] Knottnerus, 'Yeomen and Farmers in the Wadden Sea Coastal Marshes', 157.

[76] D. R. Curtis, 'The Impact of Land Accumulation and Consolidation on Population Trends in the Pre-industrial Period: Two Contrasting Cases in the Low Countries', *Historical Research*, lxxxvii (May 2014), 208; Knottnerus, 'Yeomen and Farmers in the Wadden Sea Coastal Marshes', 166.

In addition, there was a problem of accountability[77] on the part of the political and economic elites. From the middle of the fourteenth century onwards, village communities were dominated by a small number of leading families, who developed into local dynasties — called *Hoofdelingen, Haedlingen, Geschlechter* — which in periods of war assumed military functions as 'captains' and inhabited reinforced 'stone houses'.[78] In the early modern period, these lineages turned into a kind of rural gentry — called *Jonkers* in the Groninger Ommelanden. Whereas in the medieval communal model of the marshes, political offices — including those relating to water management — rotated among all of the long-established farms (though excluding cottagers and 'newcomers'),[79] in the early modern period these were increasingly monopolized by the new gentry. Individual farmers of long-established farms were still obliged to maintain their traditional stretch of sea wall (so-called *Kabeldeichung*), but they increasingly lacked the power to steer decision-making, as relevant offices were more or less 'feudalized'.[80] By 1700 most of the farmers — even those occupying long-established farms — therefore had little grip on the organization of flood protection.[81] On the other hand, large landowners, including the gentry, urban elites, princes and provinces, were confronted with a tradition of hereditary leases.[82]

[77] In famine studies, 'accountability' designates the degree of responsibility towards the protection of populations assigned to individual actors (from governments to companies and non-governmental organizations), irrespective of whether they are functioning or not in a democratic context: Stephen Devereux, 'Why Does Famine Persist in Africa?', *Food Security*, i (Feb. 2009); building on Alex De Waal, *Famine Crimes: Politics and the Disaster Relief Industry in Africa* (London, 1997).

[78] Vries, 'Frisonica Libertas', 231–2.

[79] Stefan Brakensiek, 'North-West Germany, 1000–1750', in Bas J. P. van Bavel and Richard W. Hoyle (eds.), *Rural Economy and Society in North-Western Europe, 500–2000: Social Relations. Property and Power* (Turnhout, 2010), 242–4.

[80] Hidde Feenstra, *De bloeitijd en het verval van de Ommelander adel (1600–1800)* (Groningen, 1988), 68–81. Most rewarding in financial terms were the *Schepperijen* — supervising drainage — paying an average fee of 150 to 200 florins a year in the eighteenth century, not including fines (*ibid.*, 74). In other regions offices kept on rotating, but the office and the actual exploitation of the farm were separated: R. H. Alma, (2011), 'Klauwboeken-Entstehung, Entwicklung und Überlieferung', *Quaerendo,* xli (2011); H. Feenstra and H. H. Oudman, *Een vergeten plattelandselite: Eigenerfden in het Groninger Westerkwartier van de vijftiende tot de zeventiende eeuw* (Leeuwarden-Utrecht, 2004), 67–81.

[81] For similar problems faced by the peasantry of coastal Flanders, see also Tim Soens, 'Flood Security in the Medieval and Early Modern North Sea Area: A Question of Entitlement?', *Environment and History*, xix, 2 (2013).

[82] By 1755 the farming population of the Hunsingo district of Groningen owned only 24 per cent of the land, the rest being shared among the local nobility, the citizens

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In such a situation, the farmer enjoyed a much more secure form of tenure and the advantage of fixed rents (which were not adapted to inflation). At the same time, however, the owner of the bare property rights (*blooteigenaar*) did not intervene in the maintenance, repair or upgrading of the sea walls, which remained the sole responsibility of the tenant farmer.[83] In contrast to systems based on short-term leaseholds,[84] hereditary leaseholds did not provide large landowners with an incentive to intervene either before or after the flood.

Thirdly, one final 'root cause' helps to explain why so many people in the Wadden Sea area were put at risk of dying in a storm flood: the spread of a new type of coastal land reclamation project, which was driven by merchant capitalism and which, especially in regions of traditional peasant agriculture, presents clear parallels with the economic models of early colonialism.[85] In the Wadden Sea area, this new style of drainage and land reclamation presented a clear break with the traditional system of flood protection, based on rather low sea walls protected by extensive stretches of saltmarsh in front of the sea wall (usually exploited as common).[86] The new embankments were initiated either by outsiders or by local power brokers copying foreign initiatives. They clearly assisted the territorial consolidation of principalities eager to break up local autonomy and were based upon a contested and sometimes violent reshuffling of land rights.

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of Groningen, the province of Groningen and institutional landowners (Paping, *Voor een handvol stuivers*, 184).

[83] Priester, *De economische ontwikkeling van de landbouw in Groningen*, 110. Hereditary leasehold predominated all over the Wadden sea area, except for the Dutch province of Friesland, parts of East Frisia (Amt Esen) and in many new embankments along the coast of Schleswig: Knottnerus, 'Yeomen and Farmers in the Wadden Sea Coastal Marshes', 161–8.

[84] Piet van Cruyningen, 'From Disaster to Sustainability: Floods, Changing Property Relations and Water Management in the South-western Netherlands, *c*.1500–1800', *Continuity and Change*, xxix, 2 (2014).

[85] Salvatore Ciriacono, *Building on Water: Venice, Holland and the Construction of the European Landscape in Early Modern Times* (New York, 2006); Raphaël Morera, *L'assèchement des marais en France au XVIIe siècle* (Rennes, 2011); or Tim Soens and Pieter De Graef, 'Polder Mania or Marsh Fever? Risk and Risk Management in Early Modern Drainage Projects: The Case of the Kallo Polder, Flanders, 1649 to 1662', *Agricultural History Review*, lxii (2014).

[86] Tim Soens, Greet De Block and Iason Jongepier, 'Seawalls at Work: Envirotech and Labor at the North Sea Coast before 1800', *Technology and Culture*, lx, 3 (forthcoming 2019).

Technological schemes were imported from abroad (in this case the south-western Netherlands), just like the initial capital needed for realizing the project and the settlers, who hoped for a social mobility impossible in their homeland (the so-called *Hollandereien*). Production was based on bulk output of products such as cereals, cattle and cheese for export markets, entailing 'a radical simplification of nature', in the words of Donald Worster[87] and hence displayed all the environmental instabilities typical of frontier — colonial — capitalism.[88] The adventures of Jan Adriaanszoon Leeghwater in seventeenth-century Schleswig (see section V above) illustrate many of these dynamics. But the implications become even clearer when considering the experience of the *Land* of Wursten along the east bank of the Weser estuary (Lower Saxony, Germany), recently studied by Michael Ehrhardt.[89] In the first half of the seventeenth century, the communal saltmarsh protecting the sea walls of Wursten was privatized and embanked, creating the *Neufeld* ('New Land'). As the project faced extensive flooding from the start, it had to be sold by its local initiators to an urban investor — Jan Berens Bulder and his associates from Emden — who converted his share of the Neufeld into a huge marshland estate (*Schönort*) exploited by means of tenant farms. This did not protect the area from flooding: the Christmas flood of 1717 was to kill 191 people in Wursten, including 88 children. The large majority of the victims (137 out of 191) and most of the material damage (assessed at 36,110 out of 58,340 *Reichstaler*) were found in the Neufeld.[90]

[87] Donald Worster, 'Transformations of the Earth: Toward an Agroecological Perspective in History', *Journal of American History,* lxxvi, 4 (1990), 1101.

[88] Jason W. Moore, 'The Modern World-System as Environmental History? Ecology and the Rise of Capitalism', *Theory and Society,* xxxii, 3 (2003).

[89] Michael Ehrhardt, *Dem grossen Wasser allezeit entgegen: Zur Geschichte der Deiche in Wursten* (Stade, 2007). The old land of Wursten is famous among archaeologists for its long history of settlement on so-called *Dorfwurten* (village terps or mounds) since the beginning of our era. One of these terps, *Feddersen Wierde*, has been subject to excavation and in-depth study. The village terp was continuously inhabited between the first century BC and the fifth century AD. New village terps originated in the early and classic Middle Ages, in most of the villages of the Old Land, such as Spieka, Cappel and Paddingbüttel; see Dirk Meier, *Die Nordseeküste: Geschichte einer Landschaft* (Heide, 2006), 56–9.

[90] Ehrhardt, *Dem grossen Wasser allezeit entgegen*, 364.

Examples like the Wurster Neufeld can be found from Uithuizermeeden in Groningen to the *Dagebuller Bücht* in the north of Schleswig. The seventeenth-century reclamation of the saltmarsh in front of the medieval sea walls not only deprived communities of valuable resources, it also decreased the robustness of the flood protection system and affected coastal dynamics in ways which were poorly understood. Furthermore, it trapped people in a high-risk way of living unknown in the region before. The embankment itself fitted into a broader process of social polarization, the declining autonomy of village communities and disruptions in the traditional organization of the flood protection system. Such were the root causes explaining why so many cottagers and labourers in the Wadden Sea area were at risk of dying in a storm surge in the period around 1700.

VI

TO CONCLUDE: LOCATING VULNERABILITY

In pre-industrial societies, natural variability was not something waiting to be discovered by paleoclimatologists. Depending on the region in which one lived, floods and droughts, harvest failures and epidemics, avalanches or earthquakes, or a mix of these and other nature-induced hazards, were part of everyday life. Nature-induced hazards and shocks seldom brought the type and degree of societal breakdown depicted in recent historiography on natural disasters and climatic variability in the past. Mostly through absorption, and to a lesser degree through adaptation, societies were perfectly able to overcome periodic episodes of nature-induced disasters. This had been the case for flood disasters in the pre-industrial North Sea area, and it might also have been the case for most famines, earthquakes, epidemics and so on. The fourteenth-century Black Death might have been the ultimate exception in European history, and even there, adaptation and transformation occurred in very different directions, often precipitating a remodelling of society which had started well before the event.[91] The meagre evidence for societal breakdown

[91] Christopher Dyer, *An Age of Transition?: Economy and Society in England in the Later Middle Ages* (Oxford, 2005), 244–5; and Daniel R. Curtis, Bas van Bavel and

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following nature-induced hazards is all the more striking when contrasted with recent literature about the impact of warfare, which seems much more able to provoke structural changes in, for example, inequality.[92]

Notwithstanding the overall resilience of societies, nature-induced hazards might still cause a tremendous amount of suffering and disruption to large numbers of people, although never in a random way. Specific groups in well-defined contexts saw their livelihoods fatally disturbed by a flood, a famine or an earthquake, while others might escape or even profit from the very same disaster. Societal resilience and vulnerability of people clearly are two different things.[93] It was not in their overall resilience to hazards that societies differed, but in the number of people exposed to harm and in the degree to which they were exposed. In the case of the remarkable sequence of deadly flood disasters in the Wadden Sea, culminating in the Christmas flood of 1717, a clear link can be established between on the one hand the high numbers of victims and on the other hand the marginalization of cottagers, the limited ability of local elites to extend solidarity and flood protection to the poor, as well as the quasi-colonial way of transforming the floodplains. Investigating hazards and disasters in the past, historians can reveal the mechanisms which explain who suffers and why and, through comparative research, demonstrate why the exposure to hazards was so much greater in some societies than in others.[94] For this purpose, much more research is needed on the victims of nature-induced disasters in the past, for there is

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Tim Soens, 'History and the Social Sciences: Shock Therapy with Medieval Economic History as the Patient', *Social Science History*, xl, 4 (2016), 765.

[92] As argued by Thomas Piketty, *Capital in the Twenty-first Century*, trans. Arthur Goldhammer (Cambridge, Mass., 2014) for wealth inequality in the wake of World Wars I and II; or, from a longer-term perspective, Walter Scheidel, *The Great Leveler: Violence and the History of Inequality from the Stone Age to the Twenty-first Century* (Princeton and Oxford, 2017).

[93] To a certain extent, the two could even be opposed to one another: in unequal societies, marginalization processes could expose large numbers of people to physical harm from natural hazards. At the same time, inequality concentrates capital goods in the hands of an elite, capable of protecting its assets against the impact of the very same hazards. As a result, a quick recovery becomes possible, although at the expense of a large number of deaths.

[94] As argued by van Bavel and Curtis, 'Better Understanding Disasters by Better Using History'.

surprisingly little at present. Work is needed to identify the victims and to retrace their occupations, family, wealth and living conditions, and the nature and degree of disruption they faced, as well as the mechanisms which put them at risk.

And what about resilience? Should the concept be abandoned altogether, as argued by scholars studying the perverse effects of present-day 'resilience'-oriented policies, which aim to enhance the coping capacity of individual households, while leaving the basic mechanisms which put these same households at risk intact?[95] In historical research as well, resilience-oriented frameworks might obscure the power relations producing environmental hazards, as well as falsely presuming the unavoidability — or even necessity — of environmental shocks and disasters. In other words, resilience helps to naturalize natural disasters and to turn them into random *Acts of God*, which they never were, either in the pre-industrial or in the modern period.[96] The only alternative might be to limit the concepts of resilience and vulnerability to what is really at stake in the history of disasters: the question of whether or not a society is able to limit the exposure of people to suffering and disruption. In a comparative analysis, resilience becomes a relative quality, some societies being better able than others to protect their inhabitants from harm. To put it another way, the many societies that witnessed renewed economic, social or cultural dynamics in the aftermath of a disaster, but at the same time saw a significant part of their population killed, bankrupted or forced to migrate, can no longer be labelled 'resilient'.[97] This

[95] Kaïka, '"Don't Call me Resilient Again!"'. For an analysis of resilience as a new form of 'biopolitics' in a Foucauldian way, steering populations at a distance while consolidating existing power relations and (neoliberal) economic dependencies, see Daniel O'Connor *et al.*, 'Living with Insecurity: Food Security, Resilience and the World Food Programme (WFP)', *Global Social Policy*, xvii, 1 (2016); Brad Evans and Julian Reid: 'Dangerously Exposed: The Life and Death of the Resilient Subject', *Resilience*, i, 2 (2013); Terry Cannon and Detlef Müller-Mahn, 'Vulnerability, Resilience and Development Discourses in Context of Climate Change', *Natural Hazards*, lv, 3 (2010).

[96] Knowles, 'Learning from Disaster?'; Ted Steinberg, *Acts of God: The Unnatural History of Natural Disaster in America* (Oxford, 2006).

[97] An obvious example would be the city of New Orleans in the wake of Hurricane Katrina: in economic terms (GDP per capita), the city was 'better off' after the disaster, but this was not the case for many its former inhabitants, see Tatyana Deryugina, Laura Kawano and Steven Levitt, *The Economic Impact of Hurricane Katrina on its Victims: Evidence from Individual Tax Returns* (National Bureau of Economic Research Working Paper no. 20713, Cambridge, Mass., 2014); and the

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is the only way to resolve the paradox of resilient societies producing vulnerable people.

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violent attack on 'disasters as a force for good' in economics by Naomi Klein, *The Shock Doctrine: The Rise of Disaster Capitalism* (London, 2007).