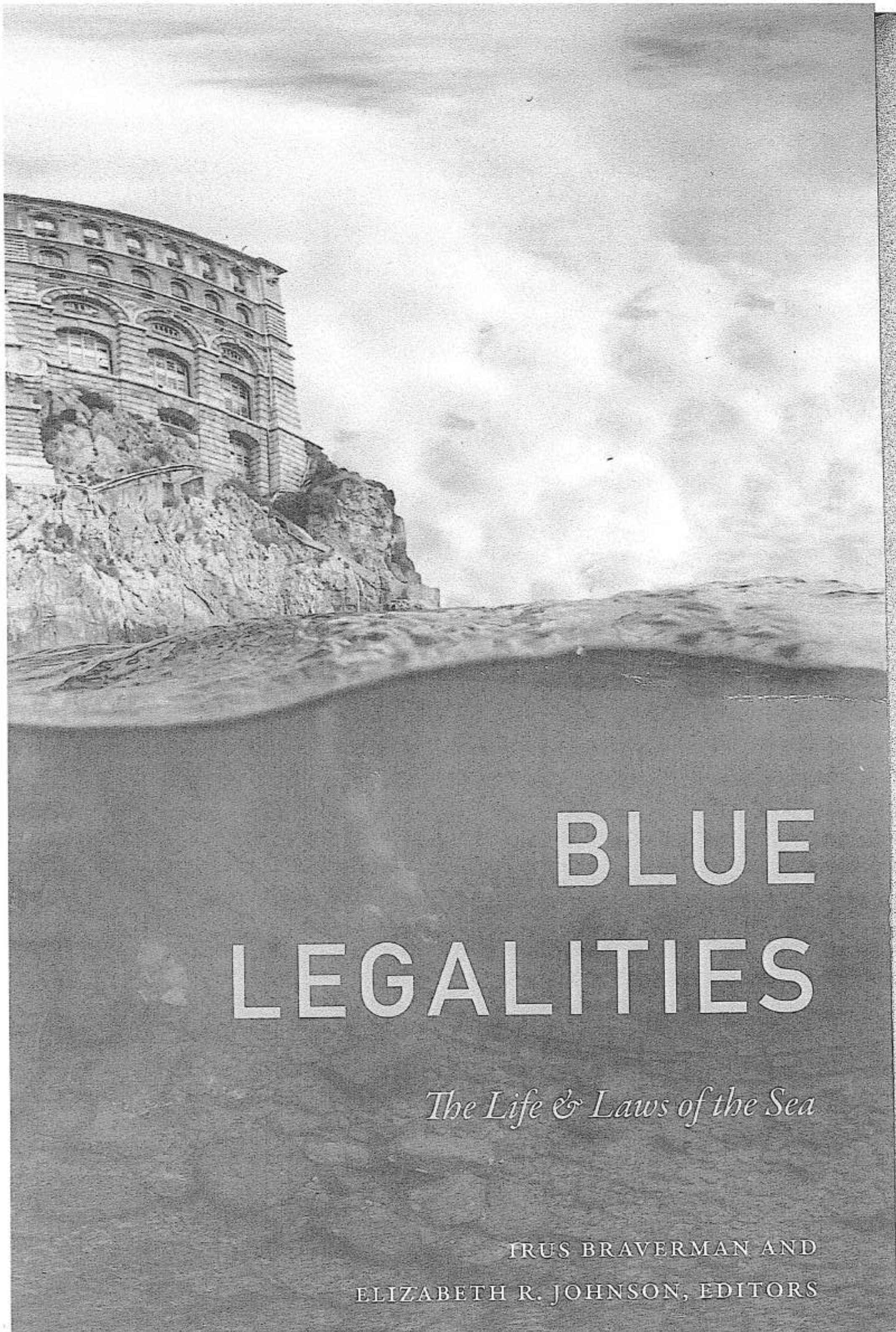

Duke U Press,
2020

6. WAVE LAW

STEFAN HELMREICH

In his *Historia Anglorum: The History of the English People*, penned in the twelfth century, Henry, archdeacon of Huntingdon, included a homiletic narrative about the deeds of King Canute the Great, a monarch who in the early eleventh century ruled over Denmark, Norway, and England (see figure 6.1). Henry's chronicle elaborated upon a legend in which King Canute attempts to command the sea to cease its tides:

> At the height of his ascendancy, he ordered his chair to be placed on the sea-shore as the tide was coming in. Then he said to the rising tide, "You are subject to me, as the land on which I am sitting is mine, and no one has resisted my overlordship with impunity. I command you, therefore, not to rise on to my land, nor presume to wet the clothing or limbs of your master." But the sea came up as usual, and disrespectfully drenched the king's feet and shins. (Henry of Huntington [1133–1155] 1996, 367–69)

This story—sometimes known as "Canute and the Waves" (see Lord Raglan 1960)—has been employed by a range of commentators to describe the overreaching arrogance of ruling power, particularly when it comes to (under)estimating the forces of large-scale processes, both natural and social. Take as one reference the comments of Louisiana lawyer Stacy Head, who in 2005 slammed the New Orleans City Council's response to Hurricane Katrina—a call "to extend daylight-saving time just for Orleans Parish" (so people would have more time to work on repairing their houses)—comparing the council's actions to those of King Canute (Nolan 2009). The Canute story, used this way, points to the folly of seeking to control, in the realm of the political, energies that might rather belong to domains beyond the human or, if human (e.g., enduring social

FIGURE 6.1. Courtiers flattering King Canute's pride, telling him that ocean waves will roll back if he so commands them. Source: Getty Images. Reproduced with permission.

conventions, revolutionary forces), may be beyond full sovereign control. But, according to University of Cambridge professor of Anglo-Saxon, Norse, and Celtic Simon Keynes (see Westcott 2011), the story is ultimately and more importantly about Canute's wisdom, for Henry's tale concludes: "So, jumping back, the king cried, 'Let all the world know that the power of kings is empty and worthless, and there is no king worthy of the name save Him by whose will heaven, earth and sea obey eternal laws.'"

This tale, of course, is not only about wisdom, but also about a medieval king's recognition of God as the real master of the earthly realm. Canute's placement of his throne on the beach articulates a theory of human sovereign power that recognizes the limits of that power even as it draws that power's command from an appeal to a higher supernatural authority. Later retellings of the Canute story treat the waves as a symbol for forces of social transformation, for tides of immigration, and for human-induced climate change; in such adaptations, the point is also to draw attention to the inexorability of processes beyond full social or political capture.

But fast forward to the early twenty-first century and return to the physical, material forces of ocean waves. We live now in a world in which it *is* possible,

to some extent, to control and command ocean waves: to build infrastructures that guard shorelines, to mold beaches that generate waves of stipulated measure and shape, and to engineer devices that harness wave energy. As historians of surfing and technology Peter Westwick and Peter Neushul have demonstrated in their book *The World in a Curl* (2013), the dimensions and profiles of waves around particular beaches and harbors have been created and destroyed many times, sculpted in response to changing coastal infrastructures and politics. And, as members of the IT University of Copenhagen's Alien Energy working group have shown, waves—in the form of wave energy—have been bundles of natural force that have been eagerly enrolled by corporate and national technological initiatives into possible energy markets and futures (Alien Energy 2017; Watts 2019; Watts and Winthereik 2017).[1] Relations among the natural, the energetic, and the political can now be imagined as synergetic, as wind waves become part of environmental infrastructures (Helmreich 2016), subject to the formatting force of political economic enterprise.

What new laws—laws not now viewed as divine edicts or as scientific descriptions of empirical regularities—do the waves of heaven, earth, and sea obey? Or, less fancifully put, what legal forms are in place to know, measure, and even control ocean waves?

Knowing Ocean Waves through Scientific and Legal Codes

What sorts of agencies have jurisdictional reach over knowledge about waves? For open ocean and near coastal waves, the International Convention for the Safety of Life at Sea, adopted by the UN's International Maritime Organization on November 1, 1974, and entered into force on May 25, 1980, charges national and international meteorological organizations with issuing, on a daily basis, "weather bulletins suitable for shipping, containing data of existing weather" (United Nations 1980, 412). Such data includes reports not only about phenomena above the ocean (wind, clouds), but also about phenomena *of* the ocean: "waves and ice" (United Nations 1980, 412).

Wave phenomena—just one slice of weather—become observational wave data when measured and monitored by such instruments as coastal and open-ocean floating buoys, satellites, ocean platforms (e.g., oil drilling platforms), and ships. That data usually includes information about wave height, wave period, and wave direction. Wave height turns out to be a less-than-straightforward measure, known not as the height of any individual wave, but rather as the statistical average of the highest third of waves in a wave field. Known as significant wave height, this measure is derived from processing a wave spectrum—that is, a wave field understood as a collection of various wavelengths. Dominant wave period is a similar statistical abstraction.[2] All of these measures of wave characteristics are the result of a long history of work in oceanography, fluid dynamics, meteorology, and coastal engineering. Significant wave height, for example, originates in the work of Scripps Oceanographer Walter Munk, who in the 1940s sought a way to calibrate scientific judgments of wave height to those folk judgments made by US marines who would be piloting amphibious craft into combat (von Storch and Hasselmann 2010, 5). The regnant scientific measure of wave height, then, was "co-produced" (Jasanoff 2004) along with and in response to a maritime, military, and operational demand. And the formalism of ocean wave energy spectra, which measures waves not as individuals, but as populations of varied wavelengths, became the source information for significant wave height when mathematicians and physicists entered wave science in force in the 1960s (Helmreich 2015; Irvine 2002; for more history of wave science, see also Cartwright 2010; Longuet-Higgins 2010; Tucker 2010). Wave height, derived from wave spectra, enfolds maritime, scientific, and mathematical operations, which then shape how waves can become objects of law.

What does wave data look like? The World Meteorological Organization (WMO) stipulates the format that such information should take. The WMO's *Manual on Codes* (World Meteorological Organization 2011) spells out technical regulations—described as "standard coding procedures"—to which weather reports and forecasts should conform. Instrumented observations of aspects of weather must therefore be filtered through a standardized syntax—this so that the WMO can route the data through its World Weather Watch program, a system of meteorological observation platforms, telecommunication networks, and computer programs that produce weather reports (World Meteorological Organization 2005, 2011). A wave observation, according to the manual, must follow the following convention:

> *WAVEOB* is the name of the code for reporting spectral wave data from a sea station, or from an aircraft or satellite platform

Essential to report in a WAVEOB file are

> Data for reporting identification (type, buoy identifier, date, time, location), indication of frequency or wave number, method of calculation, type of station, water depth, significant wave height and spectral peak period, or wave length, and optional wave parameters. (WMO 2011, A-129)

Scientifically and mathematically defined measurements and quantities made available by technologically tailored instruments, then, are here codified into

standardized forms that can circulate into other technical domains, including those to do with legal regulation. Such forms emerge from the technical capacities of such instruments as buoys as well as mathematical models of wave action that have been crafted over decades to describe ocean waves (for an in-house history of the most popular wave measurement buoy, the Datawell Waverider, see Joosten 2013; see also Helmreich 2019). Previously created naming conventions and measures crafted by bureaucracies (date, time, location) join with complex scientific parameters (e.g., spectral peak period) to produce a wave record.[3] Sheila Jasanoff writes that "the law is now an inescapable feature of the conditioning environment that produces socially embedded . . . science" (2008, 762). The reverse is also true. For wave measurements germane to the purposes of the World Meteorological Organization, scientific frameworks have come to condition legal ones.[4]

Once wave data is codified, it may be accessed in various ways—by nation-states, corporations, citizens, and other interested parties. The story is more complicated than this, too, since many nation-states and other organizations have their own, additional systems of buoys and measures—so, in fact, the WMO regulations, while providing a common argot, do not fully determine how reporting is shaped in every instance. As Jennifer Gabrys writes in *Program Earth* (2016), the world's oceans are awash in sensors that have many masters and constituencies, looping into many systems of monitoring on the internet. Gabrys calls this the "becoming environmental of computation." What media scholars have called "media ecologies" (i.e., relations among media; see Postman 1970 for the Ur-articulation) have now become part of planetary ecologies. Indeed, the planet becomes known through media—seagoing, computational, satellite-generated, and more.[5]

But let me stay with the specifics of the WMO for a moment and its interdigitation with state and international organizations and their demands for wave reporting. In the United States, the National Weather Service stewards wave data. These days, that data can be retrieved online in graphical form, from which tabular graphs can also be accessed, listing wave heights in different regions. Such graphs are rendered into forms that can be read by humans (and not only processed by computers, which do not need things like graphs).

For European polities, wave data is stewarded by the European Center for Medium-Range Weather Forecasting (ECMWF), an intergovernmental organization that hosts the world's largest store of numerical weather prediction information.[6] This data, unlike that of the US Weather Service, is not immediately open to a wide public. The data is available to "national meteorological and hydrological services and research institutions from many of the [ECMWF]

Member and Co-operating States."[7] The countries that are members of the ECMWF may each have their own specific arrangement with the ECMWF and the data they seek from it. Commercial users can also make use of various wave-prediction products by paying licensing fees, the amounts of which will depend on whether they want to pay for medium range, extended range, or long-range wave models. For example, accessing an "Ocean Wave Model high resolution 10-day Forecast" can give a user such computed model data as a "2D wave spectra," defined—in terms really only decodable by people versed in wave and weather measurement—as "Wave variance spectrum archived as a field for each discretized frequency and directional bin (what is actually encoded is log10 of the variance spectrum)" (ECMWF 2016). An institution might also want something like "significant wave height of all waves with periods within the inclusive range from 10 to 12 seconds, where the significant wave height is defined as 4 times the square root of the integral over all directions and all frequencies between 1/12 and 1/10 Hz of the two-dimension wave spectrum" (ECMWF 2016). Such instrumented measures of wave phenomenology become, in other words, products to be purchased—and purchased under legal agreements about their use. So, we see here the coconstitution of wave science, wave law, and wave commerce.

The ECMWF owns the copyright on "all real-time meteorological information that results from the transformation or processing of data sets by the ECMWF forecasting system in the form of pictures, charts, text or data files, and has been prepared specifically to meet the operational requirements of an NMS" (ECMWF 2015). So, it is not just wave data that is here proprietary, but also the *models* within which such data sits and makes sense. The data and models are closely coupled; as Lisa Gitelman (2013) has put it, "'Raw data' is an oxymoron"—that is, data always comes with a model or a framework *within which it makes sense* (see Edwards 2010). And some of that sense-making, here, is about cents-making—about money.

Such standard measured and modeled waves also meet other legal regimes (on beyond the proprietary), ones that regulate human enterprise in domains affected by wave dynamics. So, take, for example, Australia's Standing Council on Transport and Infrastructure, which, in its setting of national requirements for the safety of commercial vessels, offers measures of what will count as "smooth waters" ("waters where the significant wave height does not exceed 0.5 metres from trough to crest for at least 90 per cent of the time") and what will pass as "partially smooth waters" ("waters where the significant wave height does not exceed 1.5 metres from trough to crest for at least 90 per cent of the time") (Standing Council on Transport and Infrastructure 2012, 8). The Australian legal standard for ship safety thus embeds wave measurements. Waves in the open ocean become technical objects (Rheinberger 1997), formatted according to the World Meteorological Organization, and, so shaped, become objects that might be known, in this Australian case, through the lens of a policy promulgated for vessel safety on the open seas, with legally imposed obligations and liabilities coupling to scientifically produced data (and see National Data Buoy Center 2009 for a document that offers ways of keeping data properly recorded and organized).[8] As Nadao Kohno of Japan's Office of Marine Prediction has observed, "Only windsea and two swell are regulated in ship reports. . . . If [the] wave height of [a] calculated wave component is lower than 0.2M, the component is neglected, following the [Manual on Codes]" (Kohno 2013, 2). What is interesting here is the way that a "wave" can be counted as technically—and therefore legally present *or not* depending on its height. There is nothing legally or scientifically out of the ordinary here, of course—classification is always social, is always about the pragmatics of use (Bowker and Star 2000)—but it does illustrate the power of regulation to make some aspects of waves relevant or not relevant to particular social projects. So, even if this is not an example of a successful King Canute–styled command of the sea resulting in a substantive change in the waters themselves, it is an example of how waves can indeed be brought within a grid of interested definition and governance. Waves are made to matter within frames of legal reference.

Protecting the Shore

The examples above are of waves as objects at sea, objects to be known through science and regulation. When waves arrive at shore, they become subject to a range of additional technical and legal frameworks. At a very basic level, they become processes that unfold within state (and international) jurisdictions. In the United States (and, indeed, in many other countries) waves may roll through federal territorial seas, the contiguous zone, the Exclusive Economic Zone, and above the outer continental shelf, all internationally recognized and defined (though, also, in many cases, still contested) zones of ocean territory. In countries where renewable wave energy—energy meant to be derived from wave action—is in play, commercial enterprises dedicated to extracting this power must grapple with such boundaries (Moran 2014).

Wave measurements also frame construction projects on the shore. Take, for example, the 2005 advisory on Hurricane Katrina recovery produced by the US Federal Emergency Management Agency (FEMA). In a segment of their advisory on house design and construction in coastal zones, FEMA advises that construction techniques that make use of "wood-frame, light gauge steel or masonry walls on shallow footings or slabs" "are subject to damage when exposed to less than 3-foot breaking waves" (FEMA 2005, 1). They advise that new construction techniques take this into account, considering also the probability of such waves arriving, using a 1-in-100-years event as a benchmark.

The probability of a flood—and of waves that might crest at dangerous elevations—moves a statistical measure into the realm of human planning. Such probabilistic accountings are nothing new to coastal planning. In the Netherlands, for instance, since the 1960s, dikes have been generally built and dunes secured along the Dutch coast with the aim of protecting the country from 1-in-10,000-years flood and surge events, with such events defined as a water level exceedance of 5 meters above sea level (as measured at Amsterdam) (Voorendt 2016). Not all Dutch locales are given this same probabilistic measure for securing safety—in some places (e.g., Groningen) a 1-in-4,000-years probability is designated as the safety level. As Mark Voorendt summarizes the reasoning as it stood in the 1960s,

> The Delta Committee reasoned that a larger flood probability was acceptable for areas with a lower population density and higher ground levels (the north of the Netherlands) or smaller sub-areas (the south-western part of the Netherlands) and the West Frisian Islands. For the north and the south-western part of the Netherlands a 2.5 times higher exceedance probability was considered acceptable because of the lower economical value of that part of the country. (2016, 25)

Built into such probabilities are the wave dynamics of run-up, overtopping, overflow (all, more or less, what they sound like), some descriptions of which have been in place for centuries, well before their probabilistic framing—as in the diagram by sixteenth-century dike warden Andries Vierlingh presented in figure 6.2.

Today's descriptions of waves are thoroughly mathematical and computational—and gathered by measurement instruments that are often connected to the internet—and it is these descriptions that become built into coastal regulation. Translocal standardized measures have been coded into widely distributed and internationalized informational infrastructure, thereby becoming critical determinants of *local* regulation.

Protecting the Waves

It is, then, at the shore where wave phenomena become most subject to legal attention. Sometimes, the waves *themselves* become objects for legal protection—rather than, as in the previous section, entities to be protected against. Waves

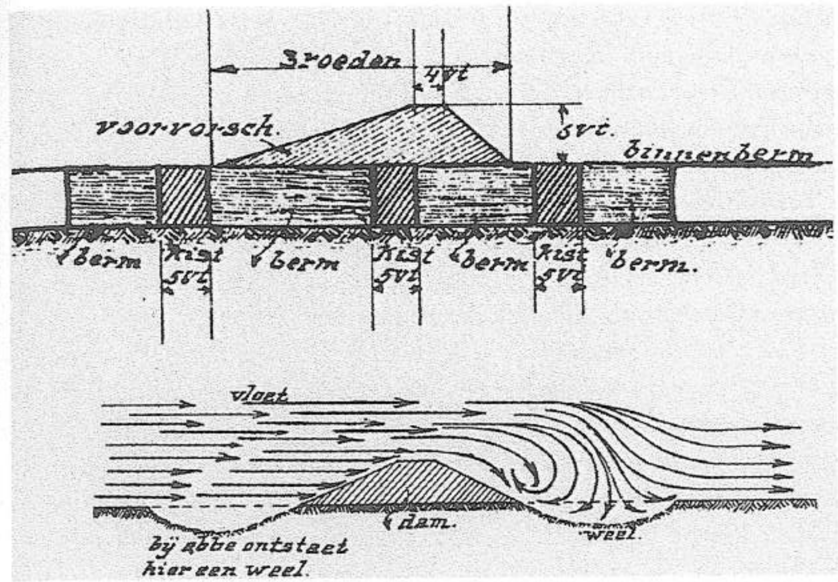

FIGURE 6.2. From Andries Vierlingh's 1578 *Treatise on Embanking*. Reproduced in Voorendt 2016.

are no longer simply entities to be survived, endured, prevented; much as coral reefs have gone from being experienced as *threatening* (to ships, for example) to being perceived as *threatened* (by scientists and ecotourists, for instance; see Braverman 2018; Sponsel 2018), so too with some kinds of coastal waves (think also of wolves, whales, or even sharks as other examples of entities once feared but now protected). Take, then, the case of the organization known as Save the Waves, an international nonprofit coalition dedicated to preserving the wave dynamics and profiles of select beaches (Save the Waves Coalition n.d.a). This organization, headed up by surfers interested in preserving waves on shorelines that might be subject to large-scale coastal engineering projects, seeks to protect waves from being modified or disappearing. They nominate, as part of their advocacy, entities they call "Endangered Waves," writing, "When an epic wave or coastline is under threat from poorly planned development or pollution, we mount campaigns to educate the public and take direct action through our Endangered Waves and Branded Campaigns" (Save the Waves Coalition n.d.a). The site lists a number of coastal sites around the world where the continued arrival and shape of desirable surfing waves is at risk (Save the Waves Coalition n.d.a). Save the Waves, contra King Canute, seeks to create the conditions by which waves can continue to operate as they have historically. Among the many strategies the organization uses (publicity, some direct action, et cetera) are legal ones. They work with local communities who hire lawyers to take a close eye to the legal frameworks behind real estate development projects. They push for environmental impact assessments. In the case of one beach in San Francisco, California, they have followed and supported the California Coastal Protection Network (CCPN), which has sued the city of San Francisco "for continued violations against the Coastal Act over the past 17 years for the illegal dumping of rock and unpermitted concrete and other debris on the shore at Ocean Beach" (Save the Waves Coalition n.d.d).

One project to which Save the Waves turned its attention in late 2016 was a seawall proposed to protect a golf course in Doughmore, Ireland. They reported on their website: "US President-Elect Donald Trump and his hotel company, Trump International Golf Links (TIGL), seek to build a massively controversial seawall on a public beach to protect his Trump Golf Resort in western Ireland" (Save the Waves Coalition n.d.c). The wall was meant to "run 2.8 kilometers, reach 15 feet tall, and consist of 200,000 tons of rock dumped in a sensitive coastal sand dune system" (Save the Waves Coalition n.d.c). Doughmore had earlier been designated a "Special Area of Conservation" by the European Union Special Habitats Directive, so there was an existing legal structure within which protection of the beach—and its waves—could work. Save the Waves reported,

> After a series of winter storms in February 2014, Donald Trump began to illegally dump boulders along the public beach at Doughmore without any permits to protect his golf course. Enraged local authorities quickly intervened and Trump was forced to cease his illegal revetment and is now required to obtain the legal permits. Trump has grown incensed that he needs to comply with the local planning regulations and has threatened to close the golf resort if his permit is not approved. Trump sought special permission from the Irish national government for the wall in March but was rejected in April. The local Clare County Council is now the responsible agency deciding the fate of Doughmore Beach. They have reviewed Trump's permit application and Environmental Impact Statement and have sent a Request for Further Information outlining 51 specific points that they want resolved or clarified. Trump has until December 2016 to submit the requested information. At that point, the Clare County Council will make a decision. All sides expect any council decision to be appealed, a process that will last several months more. (Save the Waves Coalition n.d.c)

FIGURE 6.3. #NatureTrumpsWalls. From Save the Wave Coalition n.d.c.

Here, Trump operates as the overreaching version of King Canute, seeking to control the waves that might compromise a property he owns. The wall is like Canute's throne, placed on the beach to enact a theory of sovereign power over the water.[9] In the event, Save the Waves (which collected 100,000 signatures) successfully blocked the proposed wall, following a #NatureTrumpsWalls campaign (figure 6.3) (Save the Waves Coalition n.d.b).

Beneath this story, however, is an odd wrinkle. Whereas Trump himself has famously dismissed the reality of climate change, his organization operates with climate change as part of its calculations and accounting. The environmental impact statement that Trump's people submitted in their original proposal for the Irish seawall read as follows:

> If the predictions of an increase in sea level rise as a result of *global warming* prove correct, however, it is likely that there will be a corresponding increase in coastal erosion rates not just in Doughmore Bay but also around much of the coastline of Ireland. . . . The existing erosion rate will continue and worsen, due to *sea level rise*, in the next coming years, posing a real and immediate risk to most of the golf course frontage and assets. (Partly quoted in Sherlock 2016; emphasis added)

This is not a shift to the wise and humble version of King Canute, recognizing the limits of human sovereignty. The theory of sovereignty here is, rather, a cynical one—opportunistically using coproduced legal and scientific language without regard to the truth claims it offers, but rather for the momentary rhetorical advantage it can enable. This may offer an intriguing complication to the analytic of the coproduction of science and law. Here, science and law are rhetorically coproduced at one moment and torn asunder at another (for a more general reflection on the concept of coproduction, one that points to how resistance, opposition, and friction characterize science-society relations just as much as collaborative coproduction, see Filipe, Renedo, and Marston 2017). Trump's aspiration to sovereign power (part of which he seeks to burnish by negating science [recall how he defiantly looked right at the sun during an eclipse, against the advice of ophthalmologists and astronomers!]) operates through attempting to decide when law/science will prevail and when it will not. This is not high-modernist control through data, but rather control through dissimulation and misdirection (though there is a parallel analysis to be written not about weather, but about the social field in which high-modernist control over social media data [surveillance] may be on the ascendant).

It may be no wonder that the figure of the (misguided, unwise) King Canute before the waves has been played upon in political cartoons that mock Trump's outsized denial of climate science.[10] And, at least with respect to the Save the Waves case (and a few other cases—such as Trump's travel ban), legal work has been able to push back Trump's sovereign fantasies (though this observation is not meant as a paean to law; after all, law is at once a tool, an instrument for diverse uses, and a figure that circulates widely in many arenas, with many possible politics and deployments).

In the time of Trump and attempts to roll back ocean monitoring as part of an attempt to dismantle the infrastructure that supports climate change science (Hiltzik 2017), one may fairly wonder how data about waves may fare. In early 2017, the Environmental Data and Governance Initiative (EDGI), an international network of academics and nonprofits addressing potential threats to federal environmental and energy policy, began to organize and sponsor what they called data rescue events aimed at marking specific US government databases as stores of valuable information (Schlanger 2017)—information that might be at risk, if not of erasure, then of not being properly cared for (Fortun 2005, 167, on "care of the data"; see also EDGI n.d.). EDGI's hope is that such data might be harvested by web crawlers and mirrored or saved in such repositories as the DataRefuge CKAN Repository, the Internet Archive's End of Term Archive, or Next GenClimate. As the Trump administration moves from data-oriented control to direct sovereign control over data (or its absence), attempting not to govern the waves but to govern information (or provide disinformation) about

such environmental forces, the apt figure for thinking this through may not be King Canute, but rather that version of George Orwell's Big Brother that seeks to install a language that makes communication about actually existing conditions difficult to undertake and that seeks to wash away the vocabulary, data, and capacities that keep shared, responsible, and revisable accounts of the world in circulation.

Notes

1 The Alien Energy research group takes Denmark, Iceland, and Scotland as its case studies.

2 See the National Data Buoy Center's "Handbook of Automated Data Quality Control Checks and Procedures" (2009) for an accounting of data gathered by buoys.

3 Matters may become still more complex; depending on the buoy or the sensor employed, such a record may include such things as "maximum non-directional spectral density" or even "first and second normalized polar Fourier coefficients" (World Meteorological Organization 2011).

4 Thanks to sociologist of law Susan Silbey for helping me think through this point as well as others in this chapter.

5 See also Benjamin Bratton's claim that the planet's political ecology is now made of a range of interlocking "stacks" that govern and entangle states, environments, software platforms, and more (Bratton 2015).

6 The ECMWF is headquartered in the UK. This may remain the case even in the face of Brexit; however, the organization's supercomputing infrastructure may move elsewhere, with Italy a leading contender (Amos 2017).

7 Member states are Austria, Belgium, Croatia, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Serbia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom. Co-operating States are Bulgaria, Czech Republic, Estonia, the former Yugoslav Republic of Macedonia, Hungary, Israel, Latvia, Lithuania, Montenegro, Morocco, Romania, and Slovakia (http://www.ecmwf.int/en/about/who-we-are/member-states).

8 The National Data Buoy Center, part of the US National Weather Service, was founded in 1967 and tasked with operating and maintaining a network of buoys around the waters not only of the United States, but also in extraterritorial waters around the planet. The most widespread of buoys today is called the Directional Waverider, created in the 1960s by a company called Datawell that is based in Haarlem, the Netherlands. This device, when deployed, must conform to legal and jurisdictional parameters. So, for example, the device requires a transmitter to relay its data to shore. The manual for the buoy reports that, "In case a transmitter is used within territorial waters a radio permit from the local authorities is obligatory." And, "The transmitting frequency band 28.0 MHz–29.7 MHz is reserved for amateur radio operators and needs to be avoided" (Datawell BV 2019, 3). So, right at the outset, this device for measuring waves sits within a legal framework.

9 And see Katherine Dow's study of the sociology of environment and ethics in Scotland, which has a short chapter titled "You've Been Trumped!" about Trump's efforts to build golf courses along an imperiled Scottish coast (Dow 2016).

10 See Tom Toles's cartoon in Bloom 2017.

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