

An ocean of worry

The Rising Sea by Orrin H. Pilkey and Rob Young. Washington, DC: Island Press, 2009, 193 pp.

Planning for Coastal Resilience: Best Practices for Calamitous Times by Timothy Beatley. Washington, DC: Island Press, 2009, 181 pp.

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Although Orrin Pilkey and Rob Young are skeptical of mathematical models that specify how high and how quickly sea level will rise, they have no doubt that the oceans are expanding. Because of the long time lag, they are also certain that sea level will continue to climb for decades, regardless of efforts to forestall global warming. We must therefore accept the inevitability of coastline retreat and plan for at least a seven-foot rise by 2100. Failure to do so, the authors warn, will exacerbate an impending crisis.

As Pilkey and Young demonstrate, the rising sea threatens not only beaches, coastal wetlands, mangrove swamps, and coral reefs, but also the global economy and perhaps even the international political system. The inundation of low-lying neighborhoods in coastal cities is all but certain. Several major financial centers, including Miami and Singapore, are especially imperiled. Equally worrisome is the advance of seawater into the agriculturally vital deltas of eastern and southern Asia, a process that will undermine global food security and eventually generate streams of environmental refugees. Entire countries composed of low-lying atolls, such as Tuvalu and the Maldives, may be entirely submerged, forcing their inhabitants to higher islands or continents. Finding havens for such displaced nations will, to say the least, present its own economic and geopolitical dilemmas.

The Rising Sea outlines several strategies that could be deployed to protect vulnerable communities from the mounting waters, but none are cost-effective. Seawalls and other forms of coastal armoring can only temporarily defend limited areas at great expense; shorelines so hardened will eventually turn into wave-battered capes as neighboring stretches of coast retreat. Replenishing eroded beaches with sand hauled in from elsewhere, another commonly favored strategy, is similarly dismissed as exorbitant, ecologically destructive, and doomed to failure as the sea continues to rise.

Facing the inevitable, Pilkey and Young find only one viable approach: wholesale retreat from beaches and other low-lying coastal areas. We must pull back, they argue, and allow the sea to reclaim land and infrastructure alike. In some cases buildings might be moved, but most structures along the shoreline must be abandoned. Alternative approaches, they demonstrate, are always extraordinarily expensive and can only be provisional. Arguing in hard-headed economic terms, the authors emphasize the conservative nature of their overarching proposal.

Pilkey and Young realize that few self-styled conservatives will warm to their prescriptions. As they show in a chapter aptly entitled “A Sea of Denial,” economic interests threatened by climate change strive to manufacture doubt about the underlying environmental processes. Although a handful of reputable scientists do deny global warming as well as its concomitant sea-level rise, their arguments continue to be discredited. Journalists who frame the resulting controversies as “unsettled debates” thus do the public a disservice, elevating crank theories into mainstream positions. With the issues so clouded, and given the enormous inconvenience of accepting the reality of climate change, few policymakers, let alone voters, have grasped the severity and certainty of the threat. As a result, the necessary adjustments will be difficult to enact, making our eventual reckoning with the sea all the more painful and costly.

Few scholars are as well-prepared as Pilkey and Young to confront the challenges posed by the rising sea. Pilkey, the James B. Duke Professor of Geology Emeritus at Duke University, has written, co-written, or edited more than 30 books on shoreline processes and policy. He has devoted much of his career to the study of the overbuilt North Carolina barrier islands, documenting the futility of engineering protection from storm surges. In 1985, Pilkey founded Duke’s Program for the Study of Developed Shorelines, which has explored the intersection of environmental and developmental processes in coastal zones throughout the world. In 2006, the institute moved to Western Carolina University as leadership passed to Pilkey’s former student and current co-author, Young. Young has also intensively analyzed the clogged vacation islands of the North Carolina coast, while gaining broad expertise in wetland ecosystems, hurricane dynamics, and landscape evolution

Their knowledge and experience have served them well in crafting a book of global scope. *The Rising Sea* takes on a host of contentious issues, ranging from the science of climatology to the politics of coastal planning to the economics of engineering, all the while taking into account the perverse psychology of a populace loath to acknowledge the truth when doing so proves disruptive. Although insistent, Pilkey and Young are never unduly alarmist. The seven-foot rise in sea level by 2100 that they advise us to expect is a rather modest figure. The actual rise, they readily grant, could be far greater. Yet they have steered clear of writing a panicky ecodisaster tome that might make a big impression but would risk discrediting the environmental movement. In certain respects, *The Rising Sea* is actually optimistic. “Sea-level rise,” the authors write, “does not have to be a natural catastrophe. It could be seen as an opportunity for society to redesign with nature.”

A complex equation

At first glance, sea-level rise is a straightforward phenomenon: As global temperatures increase, glaciers melt, pouring additional water into the oceans. Pilkey and Young, however, painstakingly show that the process is anything but simple. To begin with, the sea is not actually level, because of local variations in gravitational attraction. More significant complexities are introduced by the fact that some coastlines are sinking while others are rising, impeding the effort to establish a global baseline. The growth of the

oceans, moreover, also stems directly from increasing temperature: As water warms, it expands. Roughly half of the sea-level rise that has occurred during the past several decades has been caused by thermal expansion. During the next century, however, glacial melting will almost certainly become a much more significant contributor. In particular, the possible attenuation or even disintegration of the Greenland and West Antarctic ice sheets could result in a much greater than anticipated rise.

The fate of the ice caps remains the subject of considerable scientific controversy. As Pilkey and Young show, such uncertainty makes the accurate prediction of sea-level rise impossible. And if we cannot say how much or how quickly the oceans as a whole will expand, we certainly cannot predict how far the shoreline will retreat in any particular place. Local shoreline processes vary tremendously in accordance with their geological circumstances; a delta starved of sediment by dam construction, for example, will usually experience substantial land loss regardless of changes in sea level.

Such inherent variability has not prevented coastal engineers from deploying a precise mathematical model, the Bruun Rule, for predicting shoreline retreat. As Pilkey and Young demonstrate, this so-called rule, based on absurdly simple postulates, does not work as advertised. In many environments, the Bruun Rule severely underestimates the rate of seafront advance. But coastal engineers, the authors imply, are often blinded by their own interests in minimizing threats. Working closely with beach developers, engineers typically favor simple approaches that mollify their clients. The coastal engineering establishment, and in particular the Army Corps of Engineers, comes across as obstructionist, obtuse, and profligate. Indeed, one of authors' concluding recommendations is simply to "get the Corps off the shore."

Pilkey and Young's additional proposals are equally forceful. Because most barrier islands will be doomed by a mere three-foot rise, further development on them is indefensible. More generally, the authors argue that beachfront construction should be limited to small and, ideally, moveable structures. They call for the discontinuation of government programs, including disaster relief, that encourage building in vulnerable areas. "People who insist on building adjacent to eroding shorelines," they imply, should be counted as "fools rather than victims." More contentious yet is their suggestion that control over the beachfront be stripped from local governments. According to Pilkey and Young, local governments are usually beholden to property owners and developers determined to protect their investments regardless of cost or long-term feasibility. They argue that authority should be passed to higher levels of government, although they do not specify how this might be accomplished.

The planner's perspective

Timothy Beatley, author of *Planning for Coastal Resilience*, would probably concur with most of Pilkey and Young's proposals. He too is convinced that rising sea levels will require massive social and economic adjustments, including the withdrawal of human habitation from the most vulnerable beachfront areas. Not surprisingly, Pilkey finds much

to admire in Beatley's book, endorsing it on the back cover as a "critical addition to the library of anyone concerned with the future of the world's coasts."

But although the authors share many core concerns, the two books bear little resemblance to each other. Beatley is scarcely concerned with geological processes, climatological predictions, or political maneuvering. Instead he focuses on policies that coastal communities could enact to increase their resilience in the face of potential disturbances, including but not limited to those caused by the rising sea. His recommendations focus on infrastructure and buildings, but they range widely, often turning to issues of social organization. Thus he suggests that coastal resilience can be enhanced by "nurturing critical social networks and institutions" and promoting a "diverse local economy."

Most of Beatley's recommendations are laudable and all are well-meaning, but many come across as lackluster. Bold section headings give obvious advice such as "Plan Ahead for a Resilient Recovery and Growth," "Guide Growth and Development Away from HighRisk Locations," and "Think Holistically." Beatley's presentation is similarly uninspired, favoring bullet-point lists, typologies, and belabored definitions of key terms. The entire first chapter bypasses coastal issues altogether to scrutinize the concept of "resilience." Elsewhere one encounters idealistic platitudes, including the proposition that we replace our "excessive individualism" with "an ethic of helping others." As a result, *Planning for Coastal Resilience* sometime reads more like a sermonizing textbook for a course in green community planning than a trade book aimed at a broad audience.

Most disappointingly, *Planning for Coastal Resilience* actually has little to say about specifically coastal issues. Although Beatley's case studies focus on seaside communities, almost all of his policy recommendations are equally applicable to noncoastal communities. He repeatedly advocates universally relevant green practices such as building green roofs and creating pedestrian-friendly communities. Nor is there anything specifically coastal in the author's emphasis on disaster preparedness, given that most inland communities are similarly vulnerable to a variety of natural and not-so-natural calamities. Of course, sea-level rise does present coastal communities with an extraordinary threat, as Pilkey and Young show so well, but Beatley's discussion of the phenomenon is limited to a few pages.

Perhaps it is unfair to criticize a book on the basis of what it promises to be rather than what it actually is. As a brief textbook on eco-community planning with special reference to coastal areas, *Planning for Coastal Resilience* has much to recommend it. But anyone striving to grasp the monumental challenges posed by the advance of the ocean, as well as the complexities of the political debates and scientific controversies that surround it, would be advised to turn to *The Rising Sea*. Bruce Babbit does not exaggerate by much in his blurb for Pilkey and Young's book, calling it "a must read for all Americans."

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