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U.S. Coastal Flood Insurance, Risk Perception, and Sea-Level Rise: A Perspective

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This article uses coastal flood insurance policy in the United States to discuss the influence of historical and existing policy frameworks on the development of new policy directions in coastal management within a context of risk perception. It is presumed that under conditions of current and future sea-level rise, coastal planning will have to develop forward-looking policy instruments focused on managing human expectations, particularly the expectations of those living along the coast. Planning will be supported, in large part, by evolving scientific evidence on sea-level rise and the attendant hazards that accompany this phenomenon. It is likely that policy proposals for future coastal management will deviate to some degree from previous management practices. The role of previous management practices in supporting a perception of risk that deviates from actual risks is explored using historical and current coastal flood insurance policy in the United States as an example. The goal of this analysis is to highlight the importance of community risk perception, as a function of past policy practice, when considering new coastal management policy directions.

Keywords coastal flood insurance, coastal management, public policy, risk perception

Introduction

Sea-level rise is occurring and will likely intensify in the future (Church et al. 2013). Assuming current and future sea-level rise, management techniques will have to adapt to the changing coastal landscape (Nicholls 2011; Pethick 2001). For most coastal areas it is likely that new management techniques employed will vary to some degree from previous management practices (Hallegatte et al. 2013; Kittinger and Ayers 2010; Turner et al. 2007). For example, special zoning districts may be employed that place additional restrictions and requirements on development in the area (McGuire 2013, 128–137; Rabenold, 2013). The goal of these management techniques will be to maximize resiliency toward sea-level rise. And in some ways, these goals will be achieved by altering the expectations of those that live along the coast (McGuire 2013, 115–120).

For most planners and managers of coastlines, the impetus for developing new policy approaches will be the increasing probabilities of risk associated with current and future estimates of sea-level rise. Evidence supporting the call for policy changes will come from *objective* assessments of risk: scientific measurements and logic will provide the

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rationale for change. While objective assessments of risk will provide the basis for planning and management, *subjective* factors associated with risk assessment will also play a significant role in the development and acceptance of forward-looking policy proposals, especially proposals that deviate from current policy.

The purpose of this article is to highlight the potential role of subjective factors in understanding how risk is perceived and assessed. This article identifies and explains the concept of risk perception as an important factor when engaging in coastal management of sea-level rise. It explores how risk perception can influence community expectations and what this can mean when creating new policy directions aimed at managing future sea-level rise. During this exploration some unique characteristics of sea-level rise are highlighted. In particular, the relationship between current policy environments and risk perception within the context of coastal flood insurance is explored to highlight how historical and existing policies can influence future policy directions.

Background

Coastal management in the United States is, essentially, a public function that incorporates land use planning techniques in a dynamic and changing coastal environment (Allmendinger, Barker, and Stead 2002; Marcucci, Brinkley, and Jordan 2012). Planning, itself, is a practice that attempts to make rational decisions today based on past practices, current observations, and reasonable interpretations of the future (Friend and Jessop 2013). Current policy initiatives in place for a long period of time can create a kind of path dependence, establishing expectations for those impacted by the policy (Kingdon 1984; May, Workman and Jones 2008; McGuire 2011). This makes sense if one considers public policies as formalized rules that, among other attributes, establish background expectations influencing how the regulated perceive the world. Changes in these rules can impact individual and collective worldviews (Kingdon 1984; Layzer 2012, 8–9). As a result, there is a potential for conflict when new policy initiatives include changes to existing policy conditions.

Conflict arises when public acceptance is lacking for new policy directions, as public acceptance has been shown to be a dominant factor in government decision-making (Burstein 2003; Monroe 1998). One reason public acceptance can be lacking for new policy directions is the perceived risk associated with an activity does not match its actual risk. While coastal managers might focus on objective risks associated with sea-level rise, the public may discount those risks because of reliance on policies that did not account for, and possibly discounted, objective risks. In these instances there is a mismatch between perceived and actual risks.

Risk Perception as a Function of Risk

The concept of *risk perception* as referred to in this article encompasses the cumulative expression of risk by an individual or group based on both *objective* and *subjective* factors. As already noted, current observations and carefully derived models of future of sea level provide an objective basis for assessing risk. The exact risk is unknown but bounded by empirical evidence and reasonable assumptions. Medical health assessments are often derived using a similar process: empirical information is obtained (e.g., blood pressure, insulin, and cholesterol levels) and associated with other information (habits, age, etc.) to help assess risk. The prognosis (assessment) is based on this mix of empirical evidence and reasonable assumptions. Like a doctor's prognosis, coastal managers may combine

empirical evidence with reasonable assumptions to develop a risk assessment related to sea-level rise.

How communities come to accept risk is contingent on numerous factors including the heuristics, or worldviews, of community members. As noted by Tversky and Kahneman (1981, 453), “[t]he frame that a decision-maker adopts is controlled partly by the formulation of the problem and partly by the norms, habits, and personal characteristics of the decision-maker.” Knowledge, contextually defined here as the rational utilization of empirical information, can influence risk. Fisher (1930) noted an inverse relationship between risk and knowledge: the greater the knowledge, the less risk. For example, greater knowledge about the dangers of smoking can lead to a more informed understanding of the overall risk posed by cigarettes. However, knowledge alone is not determinative for understanding risk. Information framing and the underlying biases individuals and groups carry can influence risk perception. A number of studies have confirmed the role of framing and bias in how risks are assessed (Bleichrodt, Schmidt, and Zank 2009; Starmer 2000; Tversky and Kahneman 1992).

Objective and subjective factors of risk can be applied to the public’s perception of sea-level rise. Specifically, what roles do changing conditions and previous expectations play in perceptions of risk? For example, if previous policy conditions did not assume ongoing sea-level rise, then the *policy environment* created likely did not establish a strong relationship between coastal dwelling and the dangers posed by sea-level rise. Similarly, related government initiatives, such as subsidized flood insurance, can create a perception that coastal living is less dangerous, especially if the premium paid for coastal insurance is used to approximate risk. Finally, the incremental nature of sea-level rise allows objective risk factors to aggregate slowly over a long period of time potentially limiting public awareness of this increasing risk.

Understanding the unique characteristics of sea-level rise and the influence of past policy practices on the formulation of risk perception is critical when seeking to understand the affected public’s acceptance of new policy directions. Putting aside some of the unique characteristics of sea-level rise, the existing policy environment is of particular concern when considering new policy directions. This article focuses on the influence of one particular policy—coastal flood insurance—and assesses its role in influencing public risk perception.

United States Coastal Flood Insurance Policy and Risk Perception

Coastal flood insurance in the United States is essentially a government function aimed at pooling risks associated with coastal development. The federal government provides flood insurance through the National Flood Insurance Program (NFIP), which is administered through the Federal Emergency Management Agency (FEMA). Under this program, most properties located within nationally determined flood zones are required to carry flood insurance (GAO 2013).

Prior to the passage of the National Flood Insurance Act in 1968, which created the NFIP, there was no market for flood insurance. Federal lawmakers conducted a feasibility study for private flood insurance in the 1950s, but difficulties in establishing premiums based on risk probabilities made such a market unfeasible to private insurance companies (Grossman 1958). The federal government stepped in because it was already providing de facto flood insurance through federal disaster relief assistance. Unwilling to underwrite the full risks of coastal living, the National Flood Insurance Act of 1968 was created.

Initially the federal flood insurance program was entirely voluntary, but participation rates remained low. However, after Hurricane Agnes in 1972, which wrought substantial damage to the Northeastern seaboard to mostly uninsured coastal properties that received federal disaster relief (a *de facto* zero premium insurance), Congress amended the NFIP making insurance mandatory for properties located in vulnerable *Special Flood Hazard Areas*, or SFHAs. Later amendments required entire coastal communities that have SFHAs to join the NFIP as a condition of receiving federal disaster assistance (Michel-Kerjan 2010).

Attempts to rationalize coastal flood relief efforts, by first looking to private insurance (which was not interested), and then developing a voluntary system of public insurance, the federal government placed itself in the position of negotiating marginally more effective policies aimed at linking actual and perceived coastal risks. Deciding to make coastal insurance mandatory under certain conditions in the 1970s can be seen, intentionally or otherwise, as an effort to move public perceptions of risk closer to actual risks presented.

Despite the history of public flood insurance described above, evidence suggests there remains a gap between actual and perceived risks when viewed through the lens of federal coastal insurance activities. Studies done after Hurricane Sandy in 2012 show a NFIP participation rate of approximately 18% of homes located in flood zones (King 2013). In addition, while total policies in effect have increased consistently since the NFIP's inception, the average policy tenure for an insured homeowner is between two and four years. And of the insured experiencing a loss due to flooding, those with high value losses (e.g., full home replacement) are more likely to drop their insurance than those experiencing small to moderate losses (Michel-Kerjan, Lemoyne de Forges, and Kunreuther 2012).

As of early 2014, the NFIP insures approximately \$1.28 trillion dollars of property value, while charging approximately \$3.8 billion dollars in premiums (FEMA 2014). Due to recent storms, including Hurricane Sandy, the NFIP has outstanding obligations in excess of \$15 billion dollars, an amount far exceeding the \$4 billion in cash and borrowing authority it is currently provided by Congress. This evidence suggests the NFIP is underfunded. It also suggests premiums charged for existing policies are below a reasonable pooling of risk to make the program solvent. Translating this information into a proxy for perceived risk leads to the following hypothesis: the existing policy framework lowers the perceived risk of coastal living below current actual risks and the likely risks posed by future sea-level rise.

The Effect of Current Policies on New Policy Directions

The example of coastal flood insurance policy in the United States highlights the role of existing and past practices in influencing community expectations. In the example provided, the existing policy environment influences the perception of risk: subsidized insurance creates a perception that coastal flooding is a low probability event.

The association proposed in this article between subsidized flood insurance and community perception of flood risk suggests government can play an important role in how information impacts risk perception. Adopting a policy favoring a discounting of risk makes it more likely that actual risks being discounted. Adopting a policy favoring the internalization of risk, for example through higher insurance premiums, increases the likelihood that perceived and actual risks will match. This, in-turn, would increase the acceptability for forward looking coastal management planning because existing policies

would more accurately reflect actual risks thereby correlating public perception of risk to actual risks.

Those looking to develop and advance forward-looking coastal management policies must consider the effect of the current policy environment on the affected public. For coastal property owners there is a legacy of government risk subsidy through coastal flood insurance policy that has likely played a role in disassociating perceived and actual risks. Such legacies can impede new policy directions. Clear evidence of this path dependence was observed when Congress passed the Biggert-Waters Flood Insurance Reform Act of 2012, which extended the NFIP for five years but required significant reforms focused on placing more of the insurance risk onto coastal property owners. Affected coastal homeowners resoundingly rejected these amendments, due in large part to *sticker shock* through insurance premium increases, resulting in a repeal of the legislative amendment and a multi-year moratorium on policy changes (Knowles and Kunreuther 2014).

The recent failure to more accurately reflect actual and impending hazards of coastal living highlights the role of risk perception in policy development. Two lessons stand out. First, risk perception must be seen as an important part of measuring the concept of risk. Relying unilaterally on objective formulations of risk may lead to inaccurate assessments of policy acceptance. Said another way, if you do not consider how the public *feels* about the risk, then you can miss an important element in developing successful policy proposals. The second lesson reminds us of the importance of understanding the policy context in which a new policy proposal is being made. In the case of coastal flood insurance in the United States, there is a history of discounting risk. This *policy environment* creates the opportunity for the public to disassociate actual and perceived risks, which can influence all manner of coastal planning.

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