Stanford | Center for Ocean Solutions

Coastal Adaptation Policy Brief

REVISED JANUARY 2018

Triggers

Introduction

The use of "trigger language" is an emerging approach to adaptation planning where planning entities declare that an observable event will "trigger" an adaptation management response. This approach, also known as initiating "adaptation pathways," provides a sequential planning framework to manage uncertainty and address projected hazards under changing environmental and societal conditions.[1]

This sequential framework requires first identifying thresholds that would motivate a local planning body to take a more ambitious adaptation stance. For instance, trigger events that transition the policy approach throughout an adaptation pathway might include observed annual sea level above a threshold height, coastal erosion beyond a determined amount, financial harm exceeding a threshold cost, duration of inundation exceeding historic observations, or an increase in recurrance rate of storm events.

Initially, adaptation pathways might include an early phase of "no-regret" or "low-regret" strategies to minimize present risks, such as ceasing development in high hazard locations identified in a vulnerability assessment or requiring localized hazard assessments for any new development.[2] Once an initial threshold has been met or exceeded, the next phase might include more stringent controls on new development for designated "hazard zones." This stage might also require relocation plans for critical infrastructure, such as utilities. Local planning agencies can designate any number of triggering events and associated responses—such as managed relocation and other retreat measures—according to the unique circumstances and priorities of the local community.

Tradeoffs

A key advantage of the hazard "trigger" approach is that it alleviates uncertainty in adaptation planning that stems from the use of projections that can shift due to new information or a revised methodology. Tying possible adaptation responses to observable future events can help reduce the effects of this scientific uncertainty on the coastal adaptation planning process. This approach also allows long-term planning to occur now rather than during or shortly after some catastrophic flooding event or storm season. Pre-disaster recovery planning has proven that establishing pathways for action before an an event allows for more resilient, rational decision making after.[3]

While one strength of this approach is its flexibility, it is also a potential pitfall. Specifically, allowing action to occur at a future date could potentially increase a community's susceptibility to near-term risks. For example, delaying the removal of shoreline armoring until after some observed trigger, may allow a window for unwarranted damage to the coastline to occur or allow costs for removal to increase significantly. Another potential drawback of this approach is that it requires significant coordination amongst planning processes, including General Plans, Local Coastal Program updates, as well as modifications to Local Hazard Mitigation Plans.

1 Marjolijn Haasnoot et al., *Exploring Pathways for Sustainable Water Management in River Deltas in a Changing Environment*, 115 Climate Change 795, 797 (2012).

2 California Coastal Commission, Draft Residential Adaptation Policy Guidance 29 (July 2017), *available at* https://www.coastal.ca.gov/climate/slr/vulnerability-adaptation/residential/; *see generally* Jon Barnett et al., *A Local Coastal Adaptation Pathway*, 4 Nature Climate Change 1103 (2014).

3 Federal Emergency Management Agency, Pre-Disaster Recovery Planning Guide for State Governments 1 (2016), *available at* https://www.fema.gov/media-library-data/1485202780009-db5c48b2774665e357100cc69a14da68/Pre-DisasterRecoveryPlanningGuideforStateGovernments-1.pdf.

Considerations

A key consideration for incorporating trigger language into adaptation planning is that it requires a thorough vulnerability assessment. Information gleaned from this assessment will aid in identification of locations where triggers may be necessary and the relevant timeline by which hazards may increase. Planning timelines are another key factor. For instance, determining trigger event milestones will ensure alignment between projected hazard events and the ability to successfully, proactively respond to them.

In many cases, local coastal communities are hesitant to implement policies that could be perceived as too aggressive or burdensome to property owners. In these situations, a stepwise approach that involves pre-determined actions and thresholds, combined with a prescriptive monitoring schedule, can make this strategy more palatable. Likewise, incorporating observable triggers can aid the process of making difficult decisions under uncertainty.

The specific adaptation pathway should be a function of a community's vision for their coastline, and its thresholds for social, economic, and environmental harm. Placing "no regret" strategies in place allows the coastal community to maintain adaptive capacity—the ability of a system to moderate potential damages, take advantage of opportunities, or cope with consequences—under future scenarios.[4] By maintaining the capacity to pursue a variety of adaptation responses, the community would be better able to achieve their coastal vision throughout a range of hazards.

Examples:

The City of Pacific Grove in Monterey County included sea level rise triggers in their draft Land Use component of their proposed Local Coastal Plan update.[5] The "trigger" the City identified is an observation of greater than 3" rise in sea level on average for an entire year above the updated 2020 tidal epoch mean high water level at the Monterey Tide Gage.[6] This change in sea level would trigger a policy warranting a site-specific hazards study in locations indicated as potential hazard areas from a vulnerability study.[7]

The Thames Estuary 2100 project in London, England was initiated to provide a plan for tidal flood risk management in the Thames Estuary for the next century.[8] The project planning process was hindered by the uncertainty inherent in climate projections.[9] To address this uncertainty, the project included a "route map" featuring decision points and monitoring indicators that identify when new information (primarily sea level heights) will be considered in an iterative risk management framework.[10] This framework—comparable to an adaptive management framework with pre-determined trigger events—can be a model for long-term, high investment infrastructure projects that can incorporate decision points and a thorough monitoring system into their operations.

Researchers

Jesse Reiblich, Early Career Law & Policy Fellow: jesselr@stanford.edu
Eric Hartge, Research Development Manager: ehartge@stanford.edu
Cole Sito, Legal Intern

4 Intergovernmental Panel on Climate Change, Working Group II: Impacts, Adaptation, and Vulnerability, Annex B: Glossary of Terms (2001).

5 City of Pacific Grove, Draft Land Use Plan: A Component of the Local Coastal Program (2017).

6 Policy HAZ-2. *Id.* at 36.

7 Policy HAZ-12. *Id.* at 39.

8 Nicola Ranger et al., *Addressing 'Deep' Uncertainty Over Long-Term Climate in Major Infrastructure Projects: Four Innovations of the Thames Estuary 2100 Project*, 1 EURO J. Decision Processes 233 (2013).

9 *Id.* at 234.

10 *Id.* at 252.

This research was completed in collaboration with Stanford Law School and the Natural Capital Project with support by the Stanford Woods Institute for the Environment through the Realizing Environmental Innovation Program.