

# **Boats in the Sandbox:**

## **Using Role Play Simulations to Help Seaports Prepare for the Risks and Uncertainty Associated With Climate Change**

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Boats in the Sandbox: Using Role Play Simulations to Help Seaports Prepare for the Risks and Uncertainty Associated With Climate Change by Todd Schenk is licensed under a [Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License](https://creativecommons.org/licenses/by-nc-sa/3.0/).

## Introduction

Efforts to promote sustainability and engender a more robust global community require working across traditional disciplinary, methodological and sectoral boundaries (Young et al. 2006). They also require the effective integration of systems of knowledge and action (Cash et al. 2003; Clark and Holliday 2006; van Kerkhoff and Lebel 2007).

Actually achieving the necessary degree of collaboration presents a substantial challenge. In the public sector, governance typically follows well-entrenched institutional norms, or patterns, that make systemic change and cooperation outside of established, discrete relationships difficult (Baumgartner and Jones 2009; Downs 1967; Perrow 1986; Powell and DiMaggio 1991; Pressman and Wildavsky 1984). These norms have evolved over time to effectively manage persistent problems. However, environmental perturbations rife with uncertainty and complexity - like those associated with climate change - go well beyond what is possible under existing institutional arrangements. More flexibility and cooperation across boundaries is required. In addition, jurisdictional jealousies, limits on professional expertise, and constraints on resource availability have to be overcome.

The questions I am broadly interested in are whether, and how, sufficient cooperation across sectoral boundaries and among various stakeholders can be engendered to permit effective responses to highly uncertain risks. I am exploring these questions by examining the climate change-related risks facing major seaports. Many ports are expected to face sea level rise, storm surge and other challenges (Becker et al. 2012). I will explore how port planners and other stakeholders are trying to work across traditional policy subsystem boundaries to handle these risks.

Methodologically, I am preparing and employing **role-play simulation (RPS) exercises** to help port planners and relevant stakeholders explore how they might respond to climate change. Through the RPS exercises and pre- and post-exercise research and discussions, stakeholders in the major ports I study will have a chance to consider the obstacles to adaptation planning and discuss ways to deal with them.

**This working paper focuses on the use of RPS exercises as tools for exploring complex issues like climate change in the context of multi-stakeholder decision-making environments, like those associated with the management of major seaports.** The proposition is that these exercises provide safe fora in which stakeholders that are not used to working together directly can interact and experiment. The fact that the scenarios are abstractions makes it possible to zero in on the questions deemed central for consideration while pushing those of less importance into the background.

## Background: Seaports and climate change

Seaports are critical links in our modern global economy. 433 million tonnes of cargo passed through the Port of Rotterdam - the third busiest in the world by mass - in 2011 alone.<sup>1</sup> The busiest port overall, Shanghai, shipped more than 30 million containers (TEU)

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<sup>1</sup> See: <http://www.portofrotterdam.com/en/News/pressreleases-news/Pages/slight-increase-throughput-port-rotterdam.aspx>

in 2011.<sup>2</sup> Managing this astronomical flow of goods of all types, shapes and sizes is a logistical miracle. Needless to say, ports are extremely highly coordinated operations, with their myriad of activities engaged in finely orchestrated dances with and around each other, and the external actors and conditions they must deal with.

Ports have traditionally been constructed on the assumption that they will operate within relatively narrow bands of climatic variability, including sea level fluctuations. Extreme weather events and sea levels outside these design dimensions can cause critical disruptions, millions of dollars worth of damage and lost revenues.<sup>3</sup> Ports do, of course, attempt to account for variability. The Netherlands has, for example, constructed the massive Maeslant Storm Surge Barrier to protect both the port and the wider Rotterdam region from storm surges.<sup>4</sup> To make choices about major investments of this kind, however, decision makers must know which threats and degrees of variability to take into account.

Climate change represents a considerable threat to ports around the world. Sea level rise, more severe and/or frequent storms, and changes in river behavior (as most ports are constructed in deltas) pose a variety of problems (Becker et al. 2012; Stenek et al. 2011). While climate variability has always been a factor in port planning and design, the assumption has been of relatively static conditions over the medium and longer terms. The weather is highly uncertain, but the probability of a one-in-a-hundred year flood is expected to stay constant at 1% each year. Furthermore, where and how risks are factored into what are complex decision-making processes is highly institutionalized. Climate change alters the already tenuous degree of certainty, as conditions are expected to be dynamic over the long run and there is a great deal of uncertainty in the nature and degree of change. It may also introduce new threats or variables that need to be accounted for.

Those responsible for maintaining and extending regional infrastructure are accustomed to being able to muster all the information they need within their respective domains of responsibility. That will not work when it comes to climate change risks. While important work is being done to advance the notion of flexibility in design (e.g. de Neufville and Scholtes 2011), the challenges posed by climate change are further complicated by the fact that existing policymaking frameworks and institutional arrangements are ill-suited to dealing with dramatic uncertainties that cross traditional sectoral lines of responsibility or require participation and agreement among a broad array of stakeholders. Adequately assessing possibilities outside expected design dimensions requires levels of cooperation and an ability to tap multiple sources of knowledge.

### **How can ports prepare?**

A critical question is how seaports can incorporate climate change adaptation planning into their institutional environments. Given their critical role and the longer-term nature of the planning they engage in, one might expect ports to be early adopters of climate change

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<sup>2</sup> <http://www.portshanghai.com.cn/en/newsDetail.do?sessionId=6F76EE0A072786DCA3C06836FF35EF98?nid=195>

<sup>3</sup> For example, a major storm disrupted operations at the Port of Rotterdam in January of this year (see: <http://www.reuters.com/article/2012/01/05/dutch-evacuation-dyke-idUSL6E8C51A820120105>).

<sup>4</sup> See <http://www.keringhuis.nl/index.php?id=37> for more information on the Maeslant barrier.

adaptation planning. The comprehensive survey done by Becker et al. (2012) suggests that many port managers are generally aware that climate change may pose significant threats, but are doing little to prepare.

My research endeavors to build on Becker et al. (2012), which employed a wider but subsequently shallower survey methodology, to better qualitatively understand the situation on the ground in terms of if and how the threats associated with climate change are being considered and what may be done to better integrate them. Case studies will be constructed based on role-play simulation (RPS) exercises and associated in-depth interviews. I expect this research to take a more institutionally focused and multi-stakeholder approach, as expanded upon below. The methodology I propose – which revolves around the implementation of RPS exercises – is also unique, but I feel appropriate as a diagnostic tool, given that I want participants to reflect on future actions and not simply the past and present. This approach is expanded upon below.

### **Stakeholder engagement in port planning**

An equally important corollary question to how ports can prepare for climate change is how various stakeholders are responding to and engaging in the adaptation process. Each adaptation option is bound to garner support from some and opposition from others, depending on their interests. The construction of hard infrastructure, like seawalls and storm surge barriers has, for example, often faced opposition from environmental groups due to the associated ecological damages and disruptions. In contrast, port authorities and shipping interests often champion such infrastructure projects due to the protection and relative stability they provide. Various political and citizen groups may oppose, based on the high costs, or support, based on the jobs created and sense of accomplishment associated with completing large-scale infrastructure projects. Environmental groups often favor allowing nature to run its course and reclaim areas vulnerable to sea level rise and storm surges, an option typically untenable to shipping companies and ports with millions of dollars invested in fixed infrastructure.

Insofar as climate change is (or may start to) accelerating the extent and rate at which controversial adaptation-related projects are being initiated, I assume that tensions among stakeholders are increasing. How can these tensions be managed as ports adapt? This is a question of stakeholder engagement and collaborative management.

On a related note, it is quite possible that accounting for and responding to climate change is a 'hot potato' that stakeholders are aware of, but that no one wants (or knows how) to handle. In fact, the survey conducted by Becker et al. (2012) suggests this, with 86% of respondents agreeing that climate change adaptation is important, yet a minority feeling confident in their own knowledge and even fewer engaging in adaptive measures. Because responsibility for newly emerging threats is often unassigned, it is all too easy for stakeholders to assume that someone else will take the necessary action. To what degree are stakeholders aware of the risks associated with climate change, but expecting others to take responsibility for them? Are processes being initiated to collectively identify the risks and apportion responsibility? These are questions of institutional design.

### **Proposed methodology: Role-play simulation exercises**

This research aims to qualitatively improve our understanding of how port managers and other stakeholders can incorporate the risks associated with climate change into their planning and decision-making. I plan to employ a case-based methodology, engaging directly and extensively with participants.

RPS exercises shall be developed that can be used with port managers and other stakeholders as *diagnostic tools* to help them collaboratively explore how they can and do manage uncertainty and dynamic risks, like those associated with climate change. The foci will include: Assessing if and how the uncertainty associated with climate change poses any unconventional challenges, particularly to existing decision-making processes; discussing how new risks and uncertainty may be incorporated into institutions and streams of decision-making; discussing how the interests and perspectives of various stakeholders impacted by both climate change and proposed responses might be addressed; and considering potential tools for decision-making in the face of risks, like scenario planning.

The RPS exercises will revolve around fictitious or abstracted, but realistic, scenarios that port stakeholders may face. For example, an exercise might present a situation in which a port expansion is in the final stages of planning when new information is released suggesting that local storm intensity and frequency may be much greater than previously experienced and planned for in light of climate change. Participants would have to work through if and how they might process this new information, and potentially alter the expansion plans. Participants would not fill their own real-world roles in the exercise, but rather would be assigned to fill those of other stakeholders. In addition to their general instructions, each participant will be given a set of ‘confidential instructions’ that provide the background information necessary for them to effectively represent their interests and contribute to the discussion. Interviews shall be conducted with stakeholders as the exercises are developed to make them as accurate as possible.

The RPS exercises shall serve as inflection points in this research. Directly observing how each plays-out is important and should yield some insights, but the most valuable data will come from debrief conversations with the groups post-exercise, in-depth interviews with participants, and pre- and post-exercise questionnaires. The exercises themselves serve more as tools to introduce the issues and foster reflection among participants. I have successfully employed role-play simulation exercises towards similar ends in other projects, but further testing and refining this methodology is a core aim of this research.

### **Experience with RPS exercises**

The Consensus Building Institute (CBI), with which I am associated, has been using RPS exercises for decades to help decision-makers and stakeholders work through a wide range of issues. The organization is now applying its expertise in the climate change arena (Plumb, Fierman and Schenk 2011; Schenk 2011). A project I worked on involved running a comprehensive role-play simulation exercise grappling with the risks and uncertainty climate change poses to the hydroelectricity sector in Ghana. The project was commissioned by the World Resources Institute and brought together several high-level

Ghanaian decision-makers.<sup>5</sup> Data on climate change (including both hydrologic and meteorological projections), future energy sector plans and information on the decision-making environment was used to prepare the exercise. This information was gleaned from interviews with a wide range of stakeholders and a thorough literature review.

The exercise revolved around issues or questions that decision-makers may face in the not so distant future in light of climate change, but was abstracted to a fictitious place and situation similar to but not exactly the same as Ghana to depoliticize as much as possible, allowing participants to engage without compromising their real-world positions. The scenario presented was that a new dam has been approved and construction is about to begin when a report by highly regarded experts is released suggesting that climate change may significantly alter the hydrology of the river on which the dam will be located. The questions participants grappled with included: Should the dam project be modified (or halted) in light of this new climate information? If so, how should it be modified? What data is necessary for making a decision? What degree of certainty is necessary? Who is responsible for collecting data and making decisions? Moving forward, how should monitoring, evaluation and decision-making in the face of climate change be institutionalized? Each participant was assigned a role (e.g. Energy Authority) and provided confidential instructions outlining their interests vis-à-vis these questions.

The exercise was facilitated in November of 2010 with a group of high-level decision-makers and other stakeholders in Ghana. An extensive debrief discussion was facilitated with participants to extract lessons learned from the experience. Participants were first asked a series of questions to engender reflection on the exercise itself. They were then asked to connect the exercise to their real-world situations. The challenges associated with balancing competing priorities and grappling with climate change-related uncertainty were very apparent. Participants struggled with the question of how to meet current development needs while protecting against uncertain future risks, fostering discussion around how much risk is tolerable, and how risk can be reduced and better understood. The question of how decision-makers can assess the veracity of data was also discussed. Participants also wrestled with the questions of how and where these climate change-related issues should be incorporated into the decision-making process, given that it is a complicated system with a variety of actors often unaware of how or why others are making decisions that have significant impacts on the overall outcomes.

In a different project, CBI partnered with the Maryland Department of Natural Resources, the National Oceanic and Atmospheric Administration and the MIT-U.S. Geological Survey Science Impact Collaborative to develop a role-play exercise exploring how Maryland's coastal communities will adapt to climate change.<sup>6</sup> The exercise was run with over 170 mayors, county commissioners, environmentalists, business leaders and state officials during an interactive summit in April of 2009. The exercise is quite comprehensive with nine stakeholders, plus a mediator, tackling questions in the areas of 'reducing vulnerability of the built environment'; 'water and wastewater infrastructure'; 'protecting

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<sup>5</sup> See: <http://www.worldresourcesreport.org/country-scenarios/ghana-power-sector-planning-changing-climate>

<sup>6</sup> see: <http://maryland.coastsmart.org>

wetlands and wildlife'; 'farm and forestland preservation'; and 'public education'. How to deal with disagreements around information through 'joint fact finding' is an important piece of this exercise. We continue to use RPS exercises with decision-makers ranging from those engaged in local planning to stakeholders participating in international negotiations.<sup>7</sup>

### **The efficacy of RPS exercises**

While traditionally discounted as merely entertainment or ice breakers, exercises are increasingly recognized for the value they can add to the public policy making process, providing safe spaces to explore information and alternative pathways forward. I postulate that these safe spaces are all the more valuable when planning for climate change, as stakeholders face greater uncertainty and increasingly volatile situations.

The relative nascence of the climate adaptation field means that those engaged in infrastructure development and other forms of project planning have little or no experience integrating the potential impacts of climate change on their long-term investments into their analysis and decision-making. The dearth of cases in which climate change has been meaningfully integrated into project-level planning makes learning from others difficult. Simulations can present one or more possible futures to stakeholders and ask them to work through how they would respond. This can help analysts, advocates, and decision makers prepare for the particular scenarios presented and, at a broader level, can shed light on how they might respond so that plans, policies, and management and decision-making structures can be modified and capacity provided proactively. In other words, decision makers can grapple with the questions of how to prepare and who should be responsible.

When different stakeholders are brought together to play a simulation exercise, this experience helps them to understand each others points of view, interpretations of data, and sets of interests around how to best adapt to projected climate change impacts.

Decision-makers in complex environments with a range of stakeholders responsible for discrete pieces of the puzzle may not be aware of who the other players are, how they make decisions, or what their priorities are. RPS exercises force them to confront one another and experiment with collaborative decision-making. Effective exercises can help stakeholders to appreciate the value of engaging with each other to grapple with challenges that are not currently accounted for in decision-making processes, yet may impact everyone.

Conflicts around how data should be collected, analyzed and interpreted have often impeded decision-making on a range of science-intensive policy issues. RPS exercises help stakeholders to understand where the data is coming from and how scientists are using it, thereby increasing the credibility of the information in stakeholders' minds. Scientists play a key role in providing information, but it is only useful if others have confidence in it and are able to use the data appropriately. Technical information - real or simulated - can be

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<sup>7</sup> See: <http://cbuilding.org/blog/2011/building-national-consensus-international-climate-change-negotiations> and <http://cbuilding.org/publication/article/2011/adapting-climate-change-managing-tomorrow039s-risks-today039s-decisions>

provided in such a way that participants have the freedom to process it outside of their traditional roles and settings. Simulations also provide a ‘sandbox’ in which decision makers can wrestle with data that is not yet conclusive but may have major implications down the road.

This ‘sandbox’ environment also provides participants with the space to explore options without committing to things they may not be prepared for or politically able to do yet in their real world positions. Participants can discuss issues in reference to the fictional scenario presented rather than their real situations, which is less threatening. Once they have gone through this experience, they are often more willing to open up and put the issues on table in the debrief conversation. The hope is that this new willingness and ability to discuss these important issues with other stakeholders continues beyond the RPS exercise itself. Getting the right people in the room to start the discussion is contingent on having influential local conveners or project partners. CBI has been very successful in this regard.

Reflecting on a fictionalized yet realistic scenario as a group helps stakeholders to better understand potential adaptation options and start to grapple with the choices they may need to make. RPS exercises force participants to deal with concrete decisions. They have to make difficult choices, or be creative in identifying potential ‘no regrets’ options. RPS exercises can also be used to introduce potential decision support tools, like scenario planning.

Addressing the risks associated with climate change is no easy task given the high degree of uncertainty, complex decision-making environments into which this new challenge must be inserted, and competing priorities. RPS exercises provide a powerful way to introduce decision-makers to the uncertain risks climate change poses and how they might respond in concert with other stakeholders. To be effective, exercises must acknowledge the institutional environments in which planning and decision-making is made, the competing priorities of various stakeholders, and the fact that resources are limited. They should encourage stakeholders to work together and consider new ways of making decisions while recognizing existing decision-making structures.

### **Next steps**

The next step in this nascent research project is to work with local partners to construct climate change-related RPS exercises for partner seaports. I am currently in discussion with stakeholders associated with three ports – Rotterdam, Singapore and New York – and plan to develop and implement the exercises over the course of the coming year. These three ports have been selected for various reasons.

First, they constitute a convenience sample, as I have tangible leads in each that I can use to develop the required connections to port stakeholders. For example, my PhD funding is through Dutch research organization TNO, which has strong connections in Rotterdam. The participation of stakeholders, and port managers in particular, is necessary in order for this project to succeed.



Second, Rotterdam, Singapore and New York are all very large ports.<sup>8</sup> This provides some consistency, means that they are tightly integrated into the global shipping network, and underscores the importance of their operational stability in the face of climate change.

Third, all three ports face potential risks from climate change. A large proportion of Singapore's coastal land is on fill only marginally above sea level and thus prone to flooding and sea level rise (Ng and Mendelsohn 2005). The Port of Rotterdam also faces flooding and sea level rise challenges, plus risks associated with fluctuations in the flow of the Rhine and Meuse rivers (Molenaar et al. 2009). New York faces a significant sea level rise threat, plus the potential for a major storm surge to inundate docklands and port infrastructure (Rosenzweig et al. 2011).

Fourth, Rotterdam, New York and Singapore are interesting because they operate within three different overarching governance regimes or modes of organization: Neo-corporatist, neo-liberal/pluralist and top-down technocratic respectively. While they are not perfect archetypes, these three cases are fairly good examples of the different approaches. It may be interesting to consider how these different overarching systems and sets of expectations and norms color their adaptive responses. Moving forward, the question of how I assess the relationships between overarching governance paradigms and institutional norms within each port needs to be answered.

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<sup>8</sup> All three are among the 20 largest container ports in the world. See: <http://www.worldshipping.org/about-the-industry/global-trade/top-50-world-container-ports>

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