INSTITUTIONS AS KEY ELEMENT TO SUCCESSFUL CLIMATE ADAPTATION PROCESSES: RESULTS FROM THE SAN FRANCISCO BAY AREA

By Julia A. Ekstrom and Susanne C. Moser

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ABSTRACT

Even the most progressive communities and local governments in the United States are only in the beginning stages of adapting to climate change. Most places are not far enough along to evaluate outcome-oriented success metrics related to their adaptation strategies. One measure of success, however, is advancing through the process of adaptation and overcoming obstacles along the way. Case studies of local and regional government adaptation processes from the San Francisco Bay Area in California are presented here, showing a variety of barriers but also concerted strategies to overcome these obstacles. Results of both the most common barriers and the most commonly applied strategies to overcome them are institutional in nature, followed by attitudinal and values-based impediments, lack of resources, and politics. Given the importance of institutions to successful adaptation, we review common approaches used to define and evaluate effectiveness of institutions, suggesting how these approaches may be used in future studies to gauge adaptation success. Many of the strategies employed in the cases already exhibit several attributes of successful institutions, which is evidence that efforts in the region are setting the foundation for a successful path forward.

INTRODUCTION

Even the most progressive local communities in the United States are only in the beginning stages of adapting to climate change (Adger *et al.* 2007; NRC 2010; Ford *et al.* 2011). This is confirmed by the in-depth case studies in one of the most progressive regions in the country – the San Francisco Bay region in California – that we report on here. Most communities are not far enough along to evaluate the outcomes of their adaptation strategies. Rather, at such an early stage in the adaptation process, merely advancing or continuing the process can be used as a proxy for success. Our case studies show that there are many barriers that can thwart efforts to adapt, but that institution- and governance-related ones are the dominant type: many communities are getting held up before they implement strategies. One dimension of success in this situation is advancing through the process of adaptation and overcoming obstacles along the way.

In this chapter we present patterns of barriers and strategies to overcome them as identified in our study of ongoing governmental efforts in San Francisco Bay. The study focuses specifically on adaptation as a process and impediments in that process. We find that institutions play a dominant role as impediments in adaptation processes. At the same time, institutions are also key means in the strategies used to overcome these obstacles. Given their importance, we review various approaches used to define and evaluate institutional effectiveness. The chapter concludes

with a discussion of how understanding barriers can help advance adaptation, and how different approaches to measuring institutional effectiveness will yield very different answers to the question of success.

Below, we introduce the purpose of the research and the case studies. Next, we present the barriers observed and the types of strategies employed to overcome them. The final section focuses on the concept of effectiveness of institutions and how the case study already exhibit dimensions of effective institutions.

CASE STUDIES

Overview

To improve the understanding of barriers to adaptation, we used a framework previously introduced to identify and organize adaptation barriers (Moser and Ekstrom 2010; Ekstrom, Moser and Torn 2011). This diagnostic framework organizes barriers by relevant stages in the adaptation process (Figure 1) and seeks to identify the cause of each, relating the source of each barrier to one of three components that make up the given social-ecological system. The components include (1) the actors involved in the adaptation process (which typically changes over time), (2) the larger context in which they act (e.g. the governance system and socio-economic conditions), and (3) the system that is exposed to climate change and upon which adaptation efforts are focused (called the system of concern). Finally, the diagnostic framework helps map the origin of each barrier relative to the actor's influence over it and thus offers a first step in identifying interventions to overcome identified barriers. Thus the framework helps reveal practical strategies to circumvent and overcome barriers to adaptation.

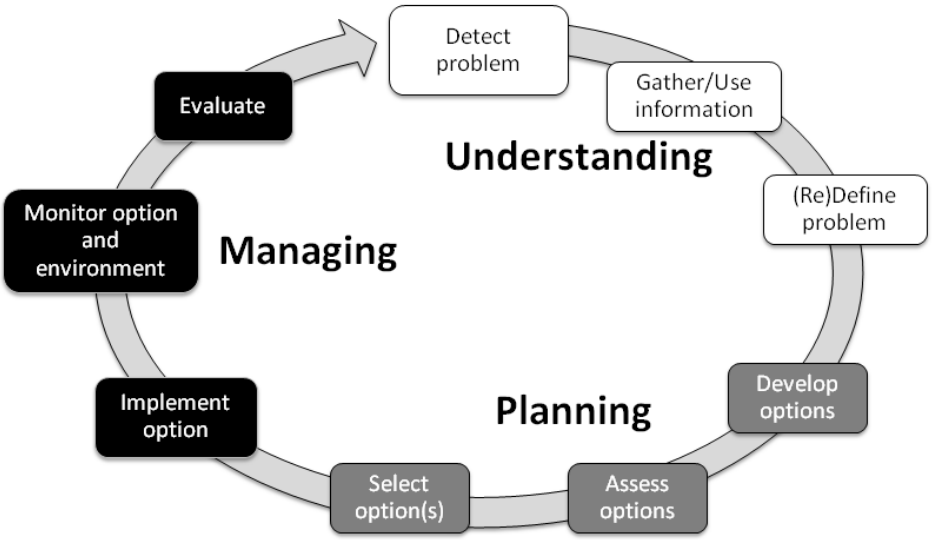

Figure 1: Ideal-type Stages of the Adaptation Decision-making Process
Source: Adapted from Ekstrom, Moser and Torn 2011

We investigate five cases using a variety of data sources and methods. We interviewed key informants, observed public meetings related to climate change adaptation, and analyzed relevant documents (e.g. climate action plans, general plans, climate-related risk assessments). For data analysis we coded interview transcripts (and tallied codes), tagging barriers (mentioned by informants or deduced by the authors), strategies pursued to overcome barriers, and advantages supporting the adaptation efforts. We then grouped barriers based on their similarity, resulting in 12 categories. Strategies used to overcome barriers and advantages were similarly grouped into a set of inductively generated categories (Moser and Ekstrom 2012).

Setting and Context

The San Francisco Bay Area region is located on the north central coast of California, USA, encompassing nine counties and 101 cities (Figure 2). The region's long history of progressive politics and seemingly high adaptive capacity (one of the highest per capita income regions in the country) coupled with its high risk of sea-level rise impacts make it a particularly compelling focus for understanding how communities are (or are not) preparing for and adapting to climate change. Specific threats that might motivate local communities to begin adaptation planning clearly vary, but sea-level rise has received the most attention thus far in the region. The increasing rate of sea-level rise combined with more extreme runoff events is expected to cause increased erosion and flooding areas along the coast, affecting critical infrastructure and causing saltwater intrusion into aquifers (for more detailed discussion of climate change impacts on the region, see Ekstrom and Moser 2012).

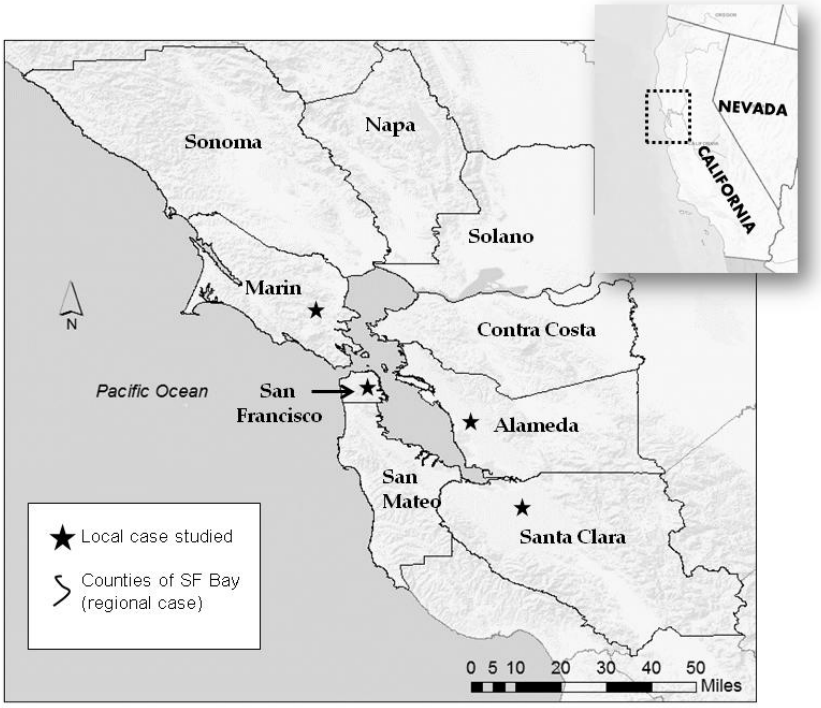

Figure 2: Map of San Francisco Bay Showing Location of the Five Case Studies
Source: Adapted from Moser and Ekstrom 2012

A total of five cases were selected, including four local jurisdictions and one regional entity leading an adaptation process in the San Francisco Bay Area:

- City of Hayward (particularly its Hayward Area Shoreline Planning Agency, HASPA)
- City and County of San Francisco
- County of Marin
- County of Santa Clara
- Joint Policy Committee

The State of California has been engaged in adaptation planning since 2008[1], releasing its first adaptation strategy in 2009 (CA Natural Resources Agency 2009) and expecting an updated version in late 2012. Efforts are recent, however, with only selected changes in policy or on-the-ground implementation of strategies to date. The research presented in this chapter is one of about 25 studies conducted in response to one of the climate adaptation strategy's overarching recommendations, namely to better understand the vulnerability and adaptation options of the state.

San Francisco Bay Area

On a regional level the San Francisco Bay Area has progressed in its awareness and efforts to adapt to climate change by focusing on the increasing risks from sea-level rise. The Bay Conservation and Development Commission (BCDC) is the regional agency with permitting authority over shoreline development. BCDC has dramatically increased public and political awareness in the region about climate change through several initiatives since 2008, including publishing sea-level rise vulnerability maps, establishing a local government adaptation assistance program, and incorporating sea-level rise adaptation requirements into its permitting process in September 2011. Amending its permitting process, however, was met by strong opposition from developers and many local governments, all fearing further regulation of land use and possible devaluation of their bay front property (see also Moser, this volume). Now a larger process through the Bay Area Joint Policy Committee (JPC) is underway to plan for advancing adaptation on a regional level to deal with sea-level rise and other impacts of climate change. The Executive Director of BCDC, a leader in regional adaptation efforts, retired from BCDC in early 2012 and joined the adaptation efforts of the JPC.

Below we introduce each local case studied with a very brief synopsis of its adaptation endeavors, highlighting where processes have particularly advanced (for detailed discussion see Moser and Ekstrom 2012).

Hayward Shoreline (HASPA)

The Hayward Shoreline is the only case studied here that focuses on a single climate issue – sea-level rise driven flooding of the shoreline. The Hayward Area Shoreline Agency (HASPA), established in 1970 to better coordinate shoreline planning activities includes the City of

[1] In November 2008, then-Governor Arnold Schwarzenegger signed Executive Order S–13–08, which directed state agencies responsible for the management of natural resources, infrastructure and public health to identify potential adaptation measures for the state's at-risk assets and populations.

Hayward and two park districts. It has been the lead on the sea-level rise related work (City of Hayward/HASPA 2011).

HASPA launched the climate adaptation process in 2008 with an initial assessment of the shoreline's vulnerability to projected sea-level rise. Through this study, the city realized that to adequately (and successfully) address its vulnerabilities, it needed to form partnerships with other jurisdictions both geographically (i.e. other cities to the north) and functionally (e.g. agencies with responsibility over water, energy, flooding and others). At the time of this study, the process had extended to include stakeholders from a larger geographic area with representatives from additional sectors. With the guidance and financial support from BCDC, they are conducting a more robust vulnerability assessment of sea-level rise impacts on the shoreline.

City/County of San Francisco

The City and County of San Francisco[2] has many separate adaptation planning efforts underway at present. Water supply management by the San Francisco Public Utilities Commission (SFPUC) is the city's most advanced agency in its commitment to climate adaptation. It coordinates closely with other water districts around the US (leading the Water Utility Climate Alliance), has expert staff dedicated to climate change, and conducts advanced scientific assessments of how climate change could alter the timing and quantity of snowmelt runoff from the Sierra Nevada that supplies the city's potable water. The SFPUC communicates with representatives from other city departments about developing a citywide adaptation plan. The Port is also conducting a sea-level rise vulnerability assessment for its shoreline property and infrastructure. The Department of Public Health, with federal funding from the Center for Disease Control, has partnered with local university scientists to assess the city's vulnerability to extreme heat events. Other sectors with notable efforts include: wastewater management and flood protection, ground transportation, planning, and the international airport. City staff shared a heightened sense of awareness of the need to develop an integrated adaptation strategy and were involved in ongoing communication across departments about developing one, but at the time of this study had not yet completed one.

Marin County

Several agencies in Marin County are involved in a small number of adaptation-related efforts across a range of departments, each with varying degrees of momentum, and with little coordination across them. The award-winning 2007 update of Marin's Countywide Plan contained strong language on the importance of adaptation, including a range of measures to adopt. However, these high aspirations have not yet been implemented, partly because the plan was written by a single agency rather than as a collaborative process, partly because of

[2] San Francisco's city boundaries match those of the county and therefore its government structures are administered in almost all functions (with minor exceptions) as one entity rather than treated as two separate governance structures.

insufficient staff, and major contention around shoreline land use. Two important advancements in the county include consideration of sea-level rise in land use and permitting of development along its Pacific coast and in assessing the sensitivity of its water supply to climate change.

Santa Clara County

In the fourth case study, Santa Clara County, efforts so far have focused on creating a strong coordinated foundation within the county's jurisdiction, though very little outcome-related progress in adaptation is apparent to date. The lead of this coordination is in the Office of Sustainability created by the County Executive Office in 2010. While individual departments of the county government are not yet explicitly engaged in adaptation planning, they are in an information sharing phase, building fundamental capacity as they wait for regional leadership from the JPC.

As with the other cases, the county's agency in charge of water supply and flood protection, Santa Clara Valley Water District (SCVWD), has made dealing with climate change an agency priority since 2007. The SCVWD tries to incorporate climate change adaptation into existing planning and operational efforts. The nature of climate change concerns differs among divisions (e.g. insufficient water supply, saltwater intrusion into coastal aquifers and wells, flooding and inundation from sea-level rise and storms). The agency also has allocated one staff to track the latest climate science, tools, and methods and share this information with others in the District.

OBSERVED BARRIERS TO ADAPTATION

Overall Patterns of Barriers

We report specific barriers for each of the five cases in Moser and Ekstrom (2012). Here we focus primarily on the overall findings of the study. Barriers across all cases fall into 12 categories (Figure 3). The most frequent barriers encountered in this study[3] are related to institutional and governance issues, followed by barriers categorized as "attitudes, values and motivations," and resource and funding issues (Figure 3). The category of attitudes, values and motivations includes issues like lack of interest, status-quo mindset, inability to accept change, narrow self-interest that hinder or delay adaptation processes from advancing. The importance of resource and funding issues, driven by the economic crisis of recent years, inaccessible funding sources, and cuts with implications for staff was surprising only in that the cases included here are among the richest in the US. The fourth most common category was termed "politics," which includes lack of political will, rivalry, turfism, and ulterior motives.

[3] The exact same barrier mentioned by more than one interviewee was counted only once so that the frequencies reported here indicate overall patterns of unique barriers encountered, not absolute frequencies from interview transcripts. For more detailed description of the methods, see Moser and Ekstrom (2012).

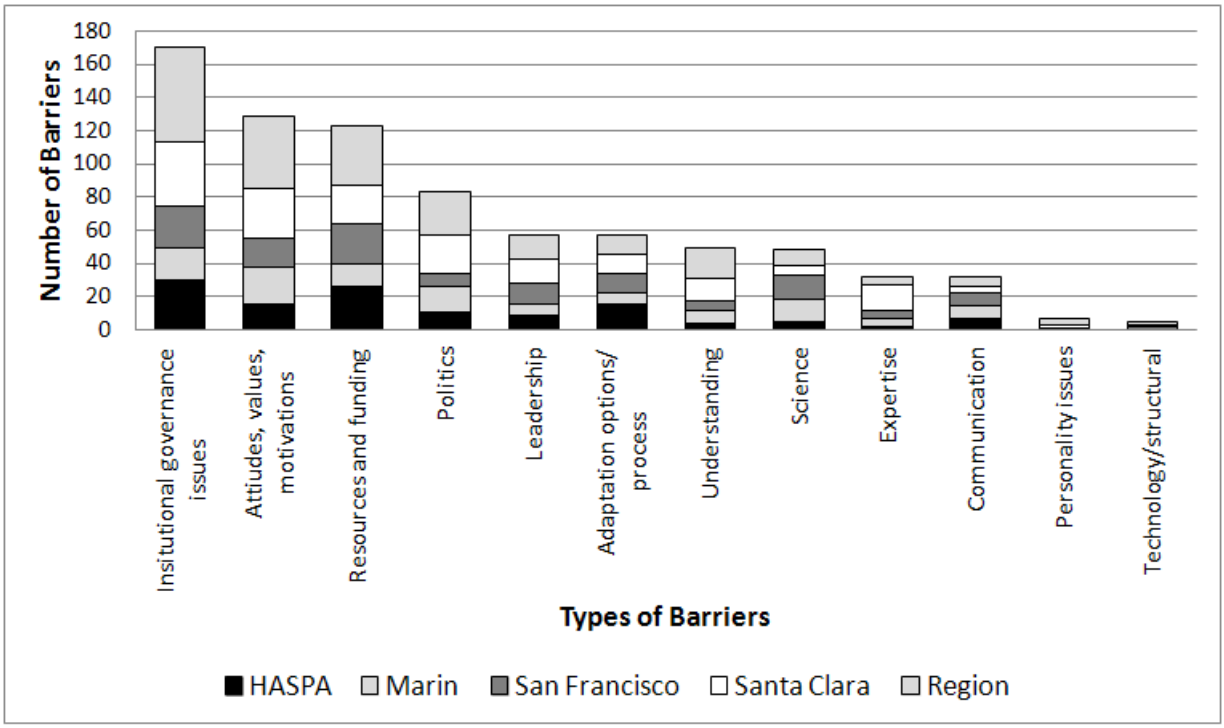

Figure 3: Frequency of Different Types of Barriers Encountered
Source: Adapted from Moser and Ekstrom 2012

The Most Common Barriers

The dominance of the top four barriers was not a surprise as they are consistently mentioned in the broader adaptation literature. Governance and institutional barriers included impediments relating to stove-piped government departments and sector-based structures of agencies that makes coordination difficult, legal barriers, and limited spatial and functional extent of jurisdictions. One legal barrier noted by HASPA informants was related to raising a levee to protect against sea-level rise. Numerous existing federal and state water quality, fisheries, and endangered species permitting requirements make such an adaptation option extremely difficult. While actors largely anticipate these obstacles to become problematic in later periods of the process, their anticipation of these legal barriers – together with the need for pooled financial resources – led them to build a larger coalition, hence extensive self-organizing for initiating and mobilizing for collective adaptive change.

The appearance of barriers related to attitudes, values, and motivations as the second most frequent category is an important finding as it documents a typically unspoken, yet crucial dimension of working toward policy change. This type of barrier hinders any policy change, often before institutional and governance barriers have the chance to impede efforts. When

associated with someone in a leadership position, it is especially challenging at the early stages in processes because there may be no formal institutional or informal mechanism in place to help overcome it. Thus, only changes in attitudes, values, and motivations – or a change in the actors themselves – will surmount this type of barrier (see also O'Brien, this volume).

Resource and funding issues are – as expected – very important. Informants mentioned more immediate issues (i.e. funded priorities) as taking precedence over adaptation (perceived to be safely delayed). One informant expressed that her department had no mandate or budget line for adaptation in its annual work plan so to allocate any of her time toward adaptation she had to "get creative in reporting her hours." Commonly adaptation was viewed as something additional that required additional funds than something that could be embedded in ongoing activities. Important to note here is that economic constraints were significant even in highly developed nations like the US (not just in developing nations; see Khan and Roberts, this volume), including some of its most affluent locations such as Santa Clara, Marin, and San Francisco.

Contrary to countless statements, justifications for research, and literature reviews (Biesbroeck *et al.* 2011; Ekstrom, Moser and Torn 2010), the relative low importance of lack of scientific information as a barrier to adaptation may surprise some (eighth in overall ranking). Our findings contradict these assumptions about the importance of scientific barriers but they are consistent with findings from other studies (Biesbroek *et al.* 2011; Dessai *et al.* 2009; Tribbia and Moser 2007; Moser and Tribbia 2006/7; see also Dilling and Romsdahl, and Preston *et al.* this volume). Our finding can be explained principally by the early stage in the adaptation process, evident in three main observations. First, the leaders pushing adaptation onto the policy agenda were generally very well informed about climate change and its potential impacts; to them there was sufficient science to begin the adaptation process – either by initiating assessments or building adaptive capacity, or raise awareness and building coalitions (see also Carmin and Dodman this volume). Second, few of the actions proposed or taken to date actually required sophisticated scientific information. And finally, the Bay Area is relatively well endowed with scientific capacity and has a comparative wealth of studies that were focused either on California or the region. This wealth of knowledge was frequently acknowledged as being sufficient to get started. Some of the scientific barriers identified included a lack of particular types of information that were anticipated to be needed at a future time, such as more certainty in rates of sea-level rise or locally-specific information about vulnerabilities and potential flooding impacts. Thus, one may expect that some scientific barriers may become bigger at later stages when adaptation strategies become more concretely formalized.

OVERCOMING BARRIERS TO ENABLE A SUCCESSFUL ADAPTATION PROCESS

Pre-existing Advantages

In our study we found that all communities have certain aids, assets and advantages that help them avoid certain barriers or are helpful in overcoming them. Among these useful "resources" are: ongoing or concurrent work on climate change mitigation and/or sustainability, existing science, strong leaders holding values that focus on the common/regional good, and good timing (e.g. for upgrading infrastructure or bringing adaptation into the planning processes as occurred in Marin County). In fact, such existing and relevant policies and planning processes, and the

momentum they already had, clearly propelled adaptation forward. Having worked on climate action plans and sustainability issues were frequently noted as having fostered awareness among staff and elected leaders for adaptation.

Strategies

When faced with a particular set of barriers and equipped with such aids, assets and advantages, what do actors do to circumvent or overcome their challenges? A first and overarching answer to this question – at least at this relatively early stage in the adaptation process – is that the strategies employed to overcome or avoid adaptation barriers *are* the adaptation strategies being pursued. A few examples: there is no governance structure to support regional adaptation, so efforts are underway to build one. Where there is not enough public awareness of climate change risks or buy-in into the need for adaptation, efforts are underway to compile scientific information and/or to conduct risk assessments to show what is at stake, and to build awareness among the public and key actors. Where money to conduct a vulnerability assessment is lacking, fundraising or pooling of available resources are strategies that communities pursue. Where leadership is problematic or lacking, someone steps up or people undertake all sorts of political maneuvers to make initiation of an adaptation process or passage and implementation of a policy more likely. As barriers differ in the difficulty with which they can be overcome so do the strategies actors use , the capacities, resources and time needed to overcome them (Moser and Ekstrom 2012).

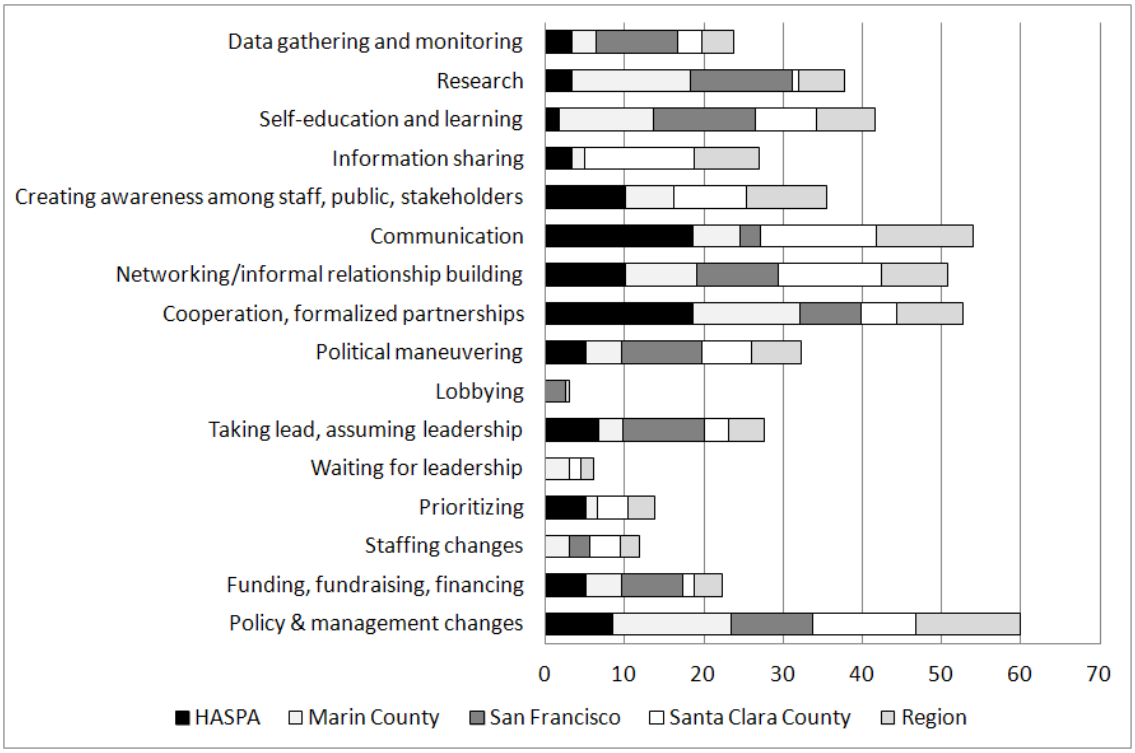

Figure 4: Most Common Strategies Used to Overcome Adaptation Barriers
Source: Adapted from Moser and Ekstrom 2012

Error! Reference source not found.4 summarizes the common strategies being used. Moser and Ekstrom (2012) provide more detailed description of the different strategies as they relate to specific barriers and ongoing adaptation processes. The purpose of looking at the all the strategies together here, represented in 16 inductively derived categories, is again to identify overarching patterns.

The most notable pattern across all cases is that the dominant strategies used to overcome barriers match – in nature – the dominant barriers being addressed. The most common type of strategy involves use of or changes to existing policy, planning processes, programs or management, including efforts to build new or change existing governance structures. For example, because BCDC only has very limited jurisdiction over the Bay shoreline, its Executive Director shifted his focus to engagement with the JPC to develop a region-wide adaptation planning process and possibly a new governance structure to support this effort. Similarly, HASPA saw the need, and followed through, to extend the representatives involved in a shoreline vulnerability assessment. Working on governance as a strategy prevails across all cases for two possible reasons. First, where adequate institutional structures are missing, governments recognize the need to build a foundation or structure through which adaptation can progress over time. Here the goal is filling an institutional gap (cf. Biesbroeck *et al.* 2011). Second, where institutions exist and the goal is incremental integration of climate change into ongoing governance processes ("mainstreaming"), institutional governance barriers to doing so must be removed. This can involve, for example, lack of or inadequate authority and cooperation, legal barriers, or contradictory organizational missions.

Most often these changes are actually very minor in and of themselves, but can be considered – and are viewed as such by the actors involved – as foundational, as "getting a foot in the door." Examples include setting an overarching theme for a general plan (as done in Marin), asking for more studies in a plan update, building governance coalitions without asking for any political or financial commitments (HASPA), making small and piecemeal changes in decisions related to infrastructure or development, or requiring development applicants to assess risks under different sea-level rise scenarios (BCDC). Most often, these strategies garner positive public attention, leave much room for flexibility and interpretation, and involve relatively small actual changes in decision making. Most informants, however, view them as essential steps toward bigger changes later on when elected officials and the public are more receptive to more substantive changes. Slowly, but steadily, they build momentum and prepare for possible windows of opportunity later on.

The second most frequent type of strategy employed relates to conscious and strategic communication. This is sensible in light of the polarized and politicized quality of the public discourse on climate change in general, and the need for making climate change real and tangible for elected officials, other colleagues, the public and non-scientific audiences. Santa Clara, for example, decided to frame its climate protection efforts (mitigation and adaptation) as efforts to build local "resilience." Interviewees there emphasized how starting a conversation with climate change often goes nowhere, and is more alienating than inviting. And "adaptation" had a connotation of reactivity and mere survival, and thus was not a winning concept (see also Moser, this volume).

Another set of interrelated strategies involves informal networking and relationship building, and creating more formal partnerships and cooperative agreements. It is noteworthy to emphasize just how much of these social capital building activities went on in support of moving adaptation forward. While intuitively not surprising, the prevalence of the informal political process, the forming of coalitions and alliances, and the countless efforts to overcome departmental "stove-piping," fragmentation and lack of formal interaction within government, across scales of governance, and among practitioners, scientists and stakeholders speaks volumes as to the importance of actors, the needed alignment of influence and authority, and the dominance of governance and institutional barriers reported on earlier.

Another category of strategies involved political maneuvering, navigating interest politics, limiting rules or cumbersome procedures; active political lobbying at higher levels of governance; strategic choices around taking or waiting for leadership; and setting priorities. The latter occurred in a few cases (e.g. the Santa Clara or the San Francisco), where informants struggled with making adaptation a priority. Often, they entailed staffing changes, e.g. assigning individuals to take clear responsibility for climate change planning, including adaptation.

Our case studies make clear that barriers – while real and in some instances formidable – with the right leaders and strategic intervention, are not insurmountable obstacles to adaptation. Identifying and understanding barriers that exist in a particular locale can trigger decisions and actions that move the effort to a significantly more advantageous level. For example, actors in Hayward realized that in order to implement the most beneficial solution, they required other jurisdictions as partners. Once this barrier was identified, they broadened their geographic and jurisdictional scope by bringing neighboring cities, water utilities, flood districts, and other constituents into the fold. In this way the barriers served not as a "show stopper" but as an impetus, combined with other factors, for a more powerful approach for the community to approach adaptation.

INSTITUTIONAL EFFECTIVENESS

But do these changes constitute success? Here we draw on institutional regime theory to address this question. Throughout this chapter, we have understood institutions as informal and formal rules, clusters of rights, and decision-making procedures (North 1990; Young 1999). By their very nature, institutions can both facilitate and channel actions of individuals and organizations, but also constrain them. The relevance of institutions is to stabilize society's activities in more or less predictable, desirable ways. Institutions that govern environmentally-relevant actions, traditionally have been set up assuming relatively stable climatic and environmental conditions, and thus may not allow flexible adjustment to new and changing conditions.

The dominant role that institutions play in hindering adaptation processes in our case studies highlights the value and importance of giving additional thought to this subject as communities adjust existing institutions and develop new ones as part of their adaptation efforts. Our results also show that strategies used to overcome barriers have most frequently been institutional ones. Is it possible to (re)create and reconfigure institutions such that they do not create more barriers to adaptation in the future (a form of path dependency)? We propose that to increase the likelihood of adapting "successfully," we can learn from what is already known about

institutional effectiveness. In fact, institutional effectiveness that facilitates adaptation processes may be a key dimension of success.

While it would be convenient to identify and prescribe a particular institutional design, one-size-fits-all panaceas are unlikely to be on the horizon, or – probably – desirable (Ostrom 2007). However, it is possible to discern the characteristics of "effective" institutions. Insights garnered from that work can inform the design and redesign of institutions in support of an adaptive (risk) management framework in the future.

Approaches to Gauging Institutional Effectiveness

In the governance literature, the concept of success is often used interchangeably with effectiveness. Even with this slightly narrowed perspective, it is still difficult to define and assess (Young 2011). Young and Levy (1999) discuss five approaches that are used to define (and thus measure) effectiveness of international regimes[4]. Their insights, we believe, can be applied to lower levels of social organization. Five different approaches are commonly discussed, which focus on slightly different aspects of effectiveness, each with unique strengths and weaknesses.

First, the "problem solving approach" assesses whether or to what degree a regime gets rid of the problem for which it was created (e.g. "Have we decreased our vulnerability to sea-level rise?"). While this goal may be most attractive to meet the needs of practitioners and scholars, in practice it is probably the most difficult approach to operationalize. It requires pinpointing the causal link between a particular institutional change and observed outcomes. This is difficult due to the long time horizons and inherent complexity of social processes involved in problem solutions. In local adaptation, this approach could be applied to strategies that have relatively short term results, such as developing or strengthening coordinated governance structures or developing an adaptation plan. The shorter term strategies (or measurable outputs delivered over short term) provide some tangible output that could be tracked and measured. The efforts in Hayward of developing a more robust sea-level rise assessment for a broader set of jurisdictions demonstrate this type of success, achieved through coordination across multiple sectors and jurisdictions. Yet a long term perspective on problem solving is the real challenge of adapting to climate change, so more work is needed to apply this approach to longer time scales.

The "legal approach" evaluates the "degree to which contractual obligations are met" (Young and Levy 1999: 4) (e.g. whether compliance is achieved or programs are initiated and implemented). This is easier to assess, but it does not necessarily answer whether the problem gets solved. For example, BCDC can track how many permit applications for shoreline development contain plans for sea-level rise (which is the legal obligation), but this would fall short of capturing whether developers followed through at the implementation stage decades in the future when a planned strategy would be realized.

The "economic approach" assesses "whether a regime generates the right outcome [and] whether it does so at the least cost" (Young and Levy 1999: 5). Young and Levy (1999) point out that it is

[4] A regime is defined here as an institution (or set of institutions) with an issue-specific focus, intended to solve a particular problem.

very difficult to apply this approach to international regimes, but it may be more easily applied at the local level, at least to gauge the economic cost of adaptation actions.

Fourth is the "normative approach", which gauges the degree of "fair or just stewardship and participation" (Young and Levy 1999: 5). This approach is most suitable to evaluate a regime and its process. This approach is commonly the focus of success arguments about climate change adaptation in developing countries, though the focus on justice is also rising in the US. For instance, central to international and national policy debates at present are the questions of who pays for adapting to climate change (Baer 2006; Dellink *et al.* 2009; NRC 2010; see also Khan and Roberts, this volume) and who gets to be at the table to decide how to adapt and respond to and prepare for climate impacts (Paavola and Adger 2005). California, including the San Francisco Bay region, has a growing number of community-based organizations and scholars focused on environmental justice that are developing methods and advocating for fair adaptation processes and outcomes (cf. Mazur *et al.* 2010; Shonkoff *et al.* 2009; Garzón *et al.* 2012).

Lastly, the "political approach" gauges whether there has been political movement motivated by the adapted or new institution. Success in the political sense might entail the creation of a set of regulations or policy even if they are not implemented, such as the adaptation portions of the Countywide Plan in Marin County, or changing staff responsibilities or creating new positions to focus on incorporating climate change into decision-making, as has been done by SFPUC, SCVWD, and BCDC. This approach focuses more on the output of an institution rather than the outcome or longer term impact, but it allows for metrics that can serve as indicators of progress – one notion of adaptation success.

One limitation of institutional effectiveness studies is that they tend to be conducted post-hoc, i.e. after the output, impact, or outcome is achieved or after a given number of years has gone by to assess the process or policy's actions in retrospect. While this could limit the applicability of the approach to adaptation at this early stage, we would argue it is useful to review success at any point in the adaptation process. Conducting evaluation while the process is ongoing can provide information useful to assist in assessing progress to date, and adjusting the process toward a more desirable pathway if necessary. In fact, because climate change will continue to change for decades and centuries to come, repeated stock-taking efforts will always be "mid-stream" and as such the very essence of an iterative, adaptive approach to managing climate risks.

Attributes of Successful Institutions Supporting Adaptation

Several propositions have been asserted about what makes an institutional regime effective. It may be useful to apply these insights, or consider them as part of a community's institutional strategy development. Dietz *et al.* (2003), for example, describe characteristics that make environmental regimes effective in addressing large-scale problems like climate change: institutions are nested; they enable informed and structured dialogue between scientists, resource users and other interested parties; they vary in purpose and character, and they are adaptable. Some of the San Francisco Bay cases already exhibit one or more of these dimensions. The region is clearly on the path toward developing nested institutions for adaptation given that local governments closely track regional adaptation-related initiatives, one county even going so far as

to dedicate an entire staff position to such an activity. Likewise regional government agencies are closely following local adaptation efforts, hoping to stay aligned with the needs of communities and local governments. In part these efforts were prompted to avoid implementation of inconsistent strategies or conflicting visions. Several of the cases studied also use strategies involving structured and informed dialogue between scientists and practitioners. The water sector appears to be particularly advanced in this capacity, in the counties of Marin, Santa Clara, and San Francisco. Flexibility to experiment, learn, and change – all part of making an institutional process adaptable – are being built into several of the processes, e.g. the state of California has published an "interim guidance document" for state agencies and others as to which sea-level rise projections to use, guidance that clearly states that it will be updated over time as the underlying science evolves (CO-CAT 2010). This attribute of adaptability is always at risk given the stabilizing nature of institutions, and vigilance is required to maintain this trait. Regular assessments and reflections on goals and strategies taken, even if informal, can be used to help make sure communities continue with effectively functioning institutions.

As the adaptation process continues, reporting out on governance-related adaptation strategies can be useful in spurring ideas for other communities trying to adapt to climate change. This would allow us to learn about using the five regime effectiveness approaches at the local level. At the same time, it is important to recognize that an institution that is successful in one setting may not be effective in another. Merely documenting adaptation strategies is not enough. Adaptation scholars and practitioners need to examine designs in context and understand the factors that contributed to success.

Future work should improve our understanding of how to design institutions that contribute positively to lessen the toll that climate change might otherwise take on communities. Institutional effectiveness offers a framework to guide such future research. Adaptation strategies identified in the San Francisco Bay Area case studies are first and foremost institutional in nature, possibly dominant when climate adaptation processes are still in their infancy. Many of the strategies employed in the cases already exhibit several attributes of successful institutions, which is evidence that – though slow – efforts in the region are setting the foundation for a successful path forward.

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