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Commentary

Why is coastal retreat so hard to implement? Understanding the political risk of coastal adaptation pathways

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ABSTRACT

Coastal climate adaptation, as a response to managing the increasing risk of inundation of coastal settlements and infrastructure, is a global challenge. As a result, there is a burgeoning body of studies recommending adaptation options, pathways and strategies generated by the research and increasingly private consulting sector. However, recent reviews of global adaptation performance repeatedly highlight a lack of implementation of many adaptation studies and plans. It is suggested here that one of the reasons why many coastal adaptation plans have not been applied is due to inadequate consideration of the political risk, underpinned by lack of consideration of potential allocation and distributional impacts of adaptation strategies. The work presented here identifies the political risk of the most common coastal adaptation pathways and approaches ('retreat', 'protect' and 'manage'). This work especially highlights the major political risk of pre-emptive planned retreat adaptation strategies, which may seem the most obvious adaptation approach from the perspective of minimising future risks to settlements and infrastructure. However, it carries the largest political risk and potential distributional impacts, which is likely to hinder the adoption of this adaptation strategy in the short term.

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1. Introduction

Sea level rise represents an increasing source of global risk (Carson et al., 2016), which is the result of two factors. Firstly, for any given location sea level rise increases the frequency and magnitude of coastal inundation events and hence is a threat multiplier in terms of natural hazards (Hunter, 2010). Secondly, more people and structures are becoming exposed or at-risk as a result of the combined actions of an increasing global population and the global migration from rural regions to urban centres, many of which are located in the coastal zone (Bell et al., 2015; Hauser et al., 2016). Therefore, coastal adaptation will be required into the future on almost all populated coastlines of the world (Nicholls, 2011).

Managing the risks of sea level rise to new coastal developments can be addressed through effective town planning mechanisms such as developing and implementing appropriate set-back lines to prevent development in coastal locations increasingly at risk (Ferreira et al., 2006). By contrast, the management of existing or legacy neighbourhoods and housing is more problematic (Rosenzweig et al., 2011; Gibbs, 2015a). Sea level rise threatens the homes of many people (Hauser et al., 2016). A number of studies have highlighted the importance of home-ownership to families in particularly western nations (for example Megbolugbe and Linneman, 1993). Therefore given this importance, it is logical for private rights-holders or home-owners to be concerned about threats to their homes both in terms of a family house and/or as a tradable asset. It also then follows that rights-holders and home-owners can be particularly sensitive to perceptions by others that future hazards or planning policies may impact the tradable value of their asset (Adger, 2003). The potential impacts of sea level rise, and wider perceptions of these impacts to existing communities is therefore becoming a contentious issue in many nations (Measham et al., 2011).

As a result of the large number of houses and buildings that are progressively at risk from global sea level rise (Dolan and Walker, 2004; Nicholls and Cazenave, 2010; Hauser et al., 2016), there has been a corresponding dramatic increase in the number of coastal adaption studies in the research and grey (technical but not published) literature (Eakin and Patt, 2011). However, despite the burgeoning number of coastal adaptation studies that have been performed, it has been argued that there has been a conspicuous lack of on-the-ground adaptation (Wheeler, 2008). This lack of

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uptake of recommendations contained in adaptation plans and studies has been identified in IPCC AR5 (Klein et al., 1999) as well as several other studies (Preston et al., 2011; Ford et al., 2011; Berrang-Ford et al., 2011; Gibbs et al., 2013). For example, Bierbaum et al. (2012) describe the state of adaptation planning in the US as '*Although substantial adaptation planning is occurring in various sectors, levels of government, and the private sector, few measures have been implemented and even fewer have been evaluated*.' Recently, Mills et al. (2016) highlight that '*Evidence on the impacts of climate change is rapidly increasing but there is little change to the speed of climate adaptation by governments and individuals*'. Greater consideration of the barriers to adaptation uptake has begun as a result of these findings (e.g. Moser and Ekstrom, 2010).

The work presented in this discussion paper proposes that a lack of consideration of political risk may be a key factor behind the observed lack of uptake of some adaptation strategies. This political risk often arises from the distributional and allocation impacts associated with coastal adaptation strategies. A number of studies of the between-country distributional effects of climate change impacts have been developed (for example Tol et al., 2004). By contrast, there is a paucity of studies that consider the local-scale distributional effects of different adaptation approaches. Allocation or distributional concerns often arise when some affected parties or stakeholders believe that they may be unfairly burdened by the allocation of costs and benefits of proposed adaptation policies. In recognition of this problem, Adger (2003) argue that adaptation policies must explicitly consider equity and legitimacy issues. The premise here is that inadequate consideration of these political risks constrains or restricts the implementation of many coastal adaptation plans that have been developed.

Coastal climate adaptation studies generally involve two tasks. The first task involves a physical oceanographic or coastal engineering study that aims to determine which parts of coastal areas are likely to be exposed to future inundation (Soleki et al., 2011). The second task involves the development of an adaptation option, pathway or strategy (Smit and Wandell, 2006). The first task is relatively well-understood and tractable through use of widely available numerical hydrodynamic models (e.g. Shi et al., 2012). This task is inherently probabilistic as a result of uncertainties in future sea levels and extreme wind, wave and precipitation conditions (Ward et al., 2015). Therefore, whilst the results of this task can be controversial, for example when individual buildings are determined to be at-risk, the analysis methods are generally well-accepted (Ruth and Coelho, 2007). The second task involves developing a set of adaption approaches, options or pathways, and then using a decision-making analysis or procedure to develop a recommended adaptation approach (e.g. Kirshen et al., 2012). The work presented in this discussion paper focuses on the option or pathway selection component of the second task. This second task, which focuses on developing a policy response, is often more controversial compared to the first task (Few et al., 2007; Füssel, 2008).

2. Coastal adaptation approaches and associated distributional effects

Coastal climate adaptation theory has typically categorised adaptation approaches into three broad categories, which are 'retreat', 'protect', and 'manage/accommodate' (Nicholls et al., 2007). The clustering of solutions into these three categories is now widespread throughout many parts of the world (Bijlsma et al., 1996; IPCC, CZMS Staff, 1992; Klein et al., 2001), although arguably is used less in the US. For example, the recently released North Atlantic Coast Comprehensive Study (NACCS; US Army Corps of Engineers, 2015) provides a compendium of adaptation measures that have not been clustered into categories of measures used by the IPCC (Intergovernmental Panel on Climate Change).

Communities, cities and regions increasingly apply a combination of these approaches. For example, after Hurricane Sandy impacted New York in 2012, the Rebuild by Design (www.rebuildbydesign.org) program was initiated. This program facilitated an international design competition to seek ways of increasing the resilience of New York to future coastal inundation events. A key result from this competition was that the identified solutions often involved combinations of the 'protect' and 'manage/accommodate' approaches. However, for the purpose of this discussion it is helpful to continue with the 'retreat', 'protect', or 'manage/accommodate' categorisation, as all of the commonly applied coastal adaptation measures will fall into one of these categories.

The 'retreat' approach involves dis-establishing settled areas, and often moving structures that are situated at locations that are at risk to locations that are not at risk from future inundation. This appears to be a logical option – physically relocating communities and buildings to a higher location or a location further from the coast in order to mitigate the risk of inundation (Klein et al., 2001). Retreat can be pre-emptive, just-in-time or reactionary. Pre-emptive planned retreat involves the systematic relocation of communities and buildings well before they are impacted by a major inundation event. Such a strategy has been advocated by researchers for many coastal cities in Australia, for example, such as on the Gold Coast (Abel et al., 2011). Just-in-time retreat approaches involve implementing retreat as late as possible but prior to major damage occurring. Just-in-time retreat may be implemented when the inundation risk becomes unacceptable to many land or home-owners, or when the mean sea level reaches a threshold level specified in advance (Bardsley and Hugo, 2010). Reactive retreat can be enacted immediately following a major inundation event and often involves governments enacting laws that prevent high-risk areas being resettled, or implementing buy-back programs. For example, the FEMA (Federal Emergency Management Agency) in the US manages a voluntary buy-out program whereby home-owners can choose to sell their homes back to government if they have been damaged by inundation events and are expected to be exposed to repeated inundation events (www.fema.gov).

The pre-emptive planned retreat approach requires relocating both private and public buildings and structures to locations further inland, higher or more generally less exposed. In a pre-emptive retreat approach the existing structures can be physically dismantled and rebuilt elsewhere. There is an associated substantial financial cost required, even if suitable land is available. The direct cost for funding the relocation of public assets is often funded directly by government unless some form of public-private funding arrangement is put in place (Leviäkangas et al., 2016). An allocation issue and moral hazard can be created if government funds are also used to fund the relocation of private property, inducing houses. This is because the taxes generated by home and business owners who have assets that are not at risk are used to compensate the owners of assets such as houses who willingly purchased houses that are at risk (Freeman, 2004). This argument becomes complicated when it is recognised that in some cases home-owners purchased houses before information of sea level rise was widely available, or when it has been unclear whether recent coastal erosion or recession is linked to climate change and sea level rise. This issue occurred on the east coast of Australia at Byron Bay where lengthy litigation has occurred between the local government and a small number of residents who own houses that are exposed to recent coastal erosion. In this case the local government attempted to pursue a community-wide climate adaptation retreat

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