



Research Paper

Urban planning and sustainable adaptation to sea-level rise



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HIGHLIGHTS

- Urban planning was found to be a key driver of adaptation to sea-level rise in Lakes Entrance, Australia.
- The processes by which adaptation actions have transpired have not guaranteed sustainable adaptation.
- We find that to be sustainable, adaptation policy must progress carefully, deliberately, flexibly, fairly, and patiently.
- Urban planning has the capacity to facilitate sustainable adaptation.
- However, modifications to urban planning institutions and processes are required in order to facilitate sustainable adaptation.

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ABSTRACT

Sea-level rise poses major challenges to coastal land uses, and therefore to urban planning processes. In theory, if done well, urban planning can lead to responses to sea-level rise that are socially and environmentally sustainable. In practice, urban planning processes may fall short of this ideal. We use multiple methods to describe and analyse how urban planning processes have led to adaptation to sea-level rise in Lakes Entrance in Victoria, Australia. Adaptation has principally taken the form of restrictions on development on low-lying land. In this town, which is considered particularly vulnerable to sea-level rise, the urban planning process and its outcomes have been controversial and divisive. Policies at the state level were imposed rapidly on this particular local community, and were later applied across the state. Our findings support the emerging consensus that to be sustainable, urban planning needs to: facilitate local ownership of adaptation responses; build collective action within local communities and between local communities and different arms and levels of government; and be fair in its application across space and over time. Addressing these social, dimensions of adaptation takes time, but they are a sine qua non of sustainable adaptation to sea-level, rise.

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1. Introduction

Sea-level rise poses major risks to lands along most coasts, and to the 600 million people and two-thirds of the world's major cities that are located in low-lying coastal areas (McGranahan, Balk, & Anderson, 2007). Climate change means that over time, coastal lands will be progressively more exposed to flooding, permanent inundation, erosion, higher storm surges, and saltwater intrusion.

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Over this same period, coastal populations and economies are projected to increase (Jongman, Ward, & Aerts, 2012). This poses major challenges to urban planning, which in most places seeks to manage use of land in a manner that addresses demands for growth, equity, and sustainability, and which now must contend with an ever increasing scarcity of habitable land (Campbell, 1996).

There is little doubt that urban planning will be a critical driver of adaptation to sea-level rise (Hurlimann & March, 2012; Measham, Preston, Smith, Brooke, Goddard, Withycombe, & Morrison, 2011; Meyer, Rannow, & Loibl, 2010; Tribbia & Moser, 2008; Wilson, 2006). One of the challenges facing urban planning as it seeks to respond to sea-level rise is defining the measures of successful adaptation. Indeed, success may be elusive given that losses are inevitable (Moser, 2013), and that adaptation will be an ongoing process of responding to change with no 'end' point (Nelson, Adger, & Brown, 2007; Stafford-Smith, Horrocks, Harvey, & Hamilton, 2011). Sustainable adaptation requires institutions that can

negotiate and address the demands made of an ever-changing landscape in ways that are just and legitimate, so that the institutions of planning as well as communities at risk are able to persist over time.

Successful adaptation must therefore be sustainable, both in terms of its ability to ensure “socially and environmentally sustainable development pathways, including both social justice and environmental integrity” (Eriksen et al., 2011: 8), but also in terms of the process itself being sustained indefinitely over time. Thus it is advantageous for the institutions of adaptation to continue for as long as sea-level rise affects coastal changes, which seems likely to continue indefinitely until some degree of equilibrium in coastal systems is reached. Thus, sustainable adaptation is all about developing institutions that will endure, and this includes urban planning. This is the essence of the nascent theory about successful adaptation that is emerging in the environment and planning literature, and which is the focus of this article.

If there is a theory that explains how to achieve successful adaptation to sea-level rise, it includes the following key factors: vertical integration among levels of government; horizontal integration between government departments and across jurisdictions (e.g. between local and state and national governments); extensive stakeholder engagement; collective agreement between local actors about the types and timing of adaptation actions; mainstreaming of adaptation into all decisions; strengthening of legal frameworks for action; allocation of the costs of benefits of adaptation amongst actors according to levels of risk; and clear and consistent guidelines and plans developed by and adhered to across all levels of government (Abel et al., 2011; Amundsen, Berglund, & Westskog, 2010; Baker, Peterson, Brown, & McAlpine, 2012; Barron et al., 2012; Eriksen et al., 2011; Few, Brown, & Tompkins, 2007b; Measham et al., 2011; Moser, Williams, & Boesch, 2012; Storbjörk & Hendren, 2011; Tompkins, Few, & Brown, 2008; Tribbia & Moser, 2008; Van den Berg, Lafferty, & Coenen, 2010; Wilson, 2006).

These factors can be categorised as being about: (1) facilitating local ownership of adaptation responses; (2) developing collective forms of action (within local communities and between local communities and different arms and levels of government); and (3) ensuring fairness across space, and over time. The focus of the literature to date has been on the social dimensions of sustainable adaptation, which we focus on here.

Standardised policy frameworks may well be necessary to ensure consistent approaches to adaptation, but the legitimacy and social sustainability of processes requires adaptation to be contextualised in and owned by local communities (Adger, Arnell, & Tompkins, 2005; Adger, Barnett, Brown, Marshall, & O'Brien, 2013; Barron et al., 2012; Douglas et al., 2012; Picketts et al., 2012). This involves more than the oft-cited calls for stakeholder engagement, which may do little more than maintain ‘the illusion of inclusion’ (Burton & Mustelin, 2013; Few, Brown, & Tompkins, 2007a). Building local ownership involves, among other things: allowing time for information about risks to settle with local cultures such that they make sense to communities, communicating in a way which resonates with cultural cognition/s; developing methods and processes to ensure local values inform the goals of adaptation responses; understanding and negotiating the trade-offs associated with different sets of responses; identifying conflict resolution processes; and to develop and implement iterative and flexible planning pathways that provide individuals and communities with some confidence that their core lived values will be sustained over time despite changes along the coast (Barron et al., 2012; Graham et al., 2013; Kahan, Jenkins-Smith, & Braman, 2011; Moser, 2013; Moser et al., 2012; Walker, Haasnoot, & Kwakkel, 2013). Overall, such local engagement needs to ensure that the process and outcomes are considered to be fair by the local community.

Collective action is no less important than local ownership for sustainable adaptation to sea-level rise. Lack of a collective government (and local) response repeatedly hampers adaptation efforts (Barnett, Waters, Pendergast, & Puleston, 2013; Moser et al., 2012). Vertical, top-down approaches have frequently undermined more local and expansive institutions that enable adaptive capacity (Brown, 2011). At a local level conflicting sets of values and worldviews creates challenges for the development and realisation of acceptable adaptation options (O'Brien & Wolf, 2010). These examples point to a need for coordinated, collective action between communities and various arms and levels of government, as well as within communities (Barnett et al., 2013).

Such collective action not only requires a large number of individuals and organisations to cooperate during planning and implementation phases, but also preparedness on the part of all parties to make sacrifices to achieve a collective benefit (Van Vugt & Snyder, 2002). Essential to achieving such an outcome is the establishment of trust among all actors. This takes time to establish and genuine effort to maintain. While adaptation may never be conflict free, sustainable adaptation can be facilitated by explicitly acknowledging the distribution of losses and the winners and losers from change and addressing these in a formal, transparent, and consistent manner. Transparent processes for mediation and conflict resolution in adaptation processes will be critical to achieve this aim.

Clear and fair policies that apply across jurisdictions, and which do not radically change over time, are also essential for sustainable adaptation (Macintosh, 2012; Storbjörk & Hendren, 2011; Tribbia & Moser, 2008). In their study of the barriers to adaptation to sea-level rise in Australia, Barnett et al. (2013) found that there are three elements of clarity and consistency that currently act as governance barriers to adaptation. These are: lack of clarity on roles and responsibilities across levels of government; lack of clarity on roles and responsibilities between the public and private sector; and inconsistency in standards and policies across jurisdictions. If sustainable adaptation is to be achieved greater consistency, clarity and coordination of adaptation governance and policy is required. Brown (2011) argues that sustainable adaptation will only be achieved if there is a fundamental institutional reconfiguration in support of long term equity, fairness and resilience. The characteristics of coastal adaptation may warrant a flexible policy approach that will endure over time, possibly in the form of a pathways type approach whereby adaptation unfolds over a sequence of linked strategies that are triggered by a change in social and/or environmental conditions (Haasnoot, Kwakkel, Walker, & ter Maat, 2013).

This nascent theory of sustainable adaptation to sea-level rise is based more on reason than evidence, for there remains very little evidence about how adaptation actually happens, particularly at the local level. This paper provides such evidence, by examining how adaptation has transpired in the town of Lakes Entrance in the state of Victoria, Australia. Through the use of Lakes Entrance as a case study, we aim to: (1) describe the origins and interactions of the urban planning processes that aimed to effect adaptation to sea-level rise; and (2) assess the extent to which these actions are consistent with the emerging consensus that sustainable adaptation requires planning responses that are locally-owned, collective, and fair. The paper begins by outlining the approach and methods used in this study, including an overview of the study area. We then explain the adaptation governance framework for the state in which the case study is set, before describing the urban planning processes that sought to effect adaptation in Lakes Entrance. This is followed by a discussion of the extent to which these have effected sustainable adaptation to sea-level rise in this case.

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