



# Evaluating a decision analytic approach to climate change adaptation of cultural resources along the Atlantic Coast of the United States



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## ABSTRACT

Climate change poses some of the most significant risks for the preservation of coastal cultural resources or cultural heritage. As a result, more research is needed to facilitate the design and implementation of feasible and transparent adaptation strategies for cultural resources under changing climate conditions. In this paper, we begin to explore the challenges and opportunities that face cultural resource managers as they begin to grapple with climate change adaptation planning in dynamic coastal environments. Specifically, we provide an overview of a value-focused, decision-analytic approach that was applied in a pilot test of climate adaptation planning for buildings within designated historic districts on the barrier islands of Cape Lookout National Seashore, North Carolina. We provide descriptions of the challenges that are uniquely facing cultural resource managers and initial evidence of the utility of this type of approach for informing judgments by presenting pre- and post-workshop survey data. Although additional research is critical to offer planning and policy guidance, we found that structured deliberations about cultural resource adaptation planning not only influenced participants' opinions but also provided a necessary space to better understand the complexities of climate and budget uncertainties. Our evaluation is a first step at documenting the difficult and value-laden decisions that must be addressed by cultural resource managers as fiscal constraints and impending climate impacts threaten the traditional approach of preservation in perpetuity.

## 1. Introduction

Climate change poses some of the most significant management and policy challenges for the coastlines throughout the world. In response, there has been considerable attention given to coastal climate mitigation and adaptation planning efforts within the contexts of sustainable urban development (e.g., Geneletti and Zardo, 2016; Hughes, 2015; Kashem et al., 2016), and natural resource management and conservation (e.g., Asare et al., 2013; Baró et al., 2014; Caves et al., 2013; Hannah et al., 2013; Hole et al., 2011; Lawler, 2009; Millar et al., 2007; Murtinho et al., 2013; Santana-Cordero et al., 2016; Thompson et al., 2012; Tompkins and Adger, 2004; Wiens and Bachelet, 2010). Although climate change impacts have particularly serious implications on the preservation of cultural resources, particularly those located on the constantly shifting landscapes of barrier islands (Caffrey and Beavers, 2008; Sargent and Slaton, 2015), research on cultural resource climate adaptation planning is limited (Fatorić and Seekamp, 2017). In a context of planning for sea-level rise within coastal national parks in the U.S., Caffrey and Beavers (2013) explain that “one challenge related to climate change that has yet to be fully articulated and addressed is the

imminent loss of some of our cultural heritage to sea-level rise or storm surge and the resulting coastal erosion” (p. 11).

Cultural resources provide important socio-cultural and conservation benefits (Boniface, 1995); yet, time is limited for decision-making about how to adapt these irreplaceable symbols of our heritage (Caffrey and Beavers, 2013). Therefore, there is a considerable need to address cultural resource preservation under changing climate conditions, particularly for research that focuses on efficient and sustainable climate adaptation planning strategies for cultural resources and, subsequently, the implementation of such strategies (Cassar, 2009; Fatorić and Seekamp, 2017).

Climate adaptation planning effectively represents a decision-making process where actions that are expected to best achieve adaptation objectives are selected (IPCC, 2014). In this paper, the focus is on proactive adaptation planning (Berrang-Ford et al., 2011) that could moderate the risks of future climate change and present opportunities for change (Simonet and Fatorić, 2016). Specifically, the aim of the present paper is to provide an overview of the outcomes from the first phase of a specific decision-analytic approach, structured decision making (SDM), that was used in a pilot project for cultural resource

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climate adaptation planning at Cape Lookout National Seashore, North Carolina. The first phase included a weeklong workshop with a variety of decision and policy-makers, climate change and historic preservation experts, and local stakeholders to (a) frame the problem and (b) determine the objectives for climate adaptation planning of two historic districts. Our analysis includes providing descriptions of the challenges faced as these individuals grappled with diverse and competing values, policy and regulatory limitations, and climate science uncertainties during a weeklong workshop. Additionally, we provide initial evidence of the utility (opportunity) of this type of decision-analysis approach for co-learning and informing cultural resource adaptation planning by presenting pre- and post-workshop survey data.

The term “cultural resource”, as defined by the United States National Park Service (NPS), is “a tangible entity or a cultural practice”. Tangible entities are categorized as historic districts, historic sites, historic buildings, historic structures, and historic objects listed in the National Register of Historic Places and as archeological resources, cultural landscapes, structures, museum objects, and ethnographic resources for NPS management purposes. Cultural practice is a pattern of behavior associated with a particular way of life (e.g., musical performance, craft production) (NPS, 1998). For the purpose of this paper, we focus on the historic buildings and associated cultural landscapes within historic districts listed in the National Register of Historic Places.

### 1.1. Climate change adaptation planning for cultural resources

Adaptation planning generally includes steps of identifying vulnerability (problem); gathering data and assessing risks; developing, evaluating and selecting adaptation options; implementing options; and monitoring and evaluating adaptation implementation (Bierbaum et al., 2013; IPCC, 2014; Moser and Ekstrom, 2010). These adaptation scholars recommend using a range of activities that occur prior to implementing a decision, such as social learning, communication, innovation, use of the best available science, cooperation, deliberation and the formation of a process by which a robust decision can be made in the face of uncertainty. Kettle and Dow (2014) documented that understanding the influence of climate (e.g., climate change scenarios) and non-climate uncertainties (e.g., predictability of budgets, political environment, stakeholders’ values) on decision making process is important as it may affect behavior, timing and degree of climate adaptation effort.

Increasing global awareness of the observed and future climate change impacts is enabling climate change adaptation to become a mainstream strategy for addressing climate change vulnerability and climate risks, evidenced by a broad range of scientific research and policy developments (e.g., Berrang-Ford et al., 2011; Bierbaum et al., 2013; Biesbroek et al., 2010; IPCC, 2014; Kim et al., 2017). Despite this attention to climate change adaptation in the scientific and political arenas, limited research has been conducted on climate adaptation planning for cultural resources or cultural heritage, both internationally (Carmichael, 2015; Dupont and Van Eetvelde, 2013; Fatorić and Seekamp, 2017; Moradi and Akhtarkavan, 2008; Phillips, 2014; UNESCO, 2014; Vallega, 2003) and within the United States (e.g., Brabec and Chilton, 2015; Caffrey and Beavers, 2008; Melnick et al., 2015; Sargent and Slaton, 2015). Moreover, as values, socio-cultural trends, political and economic forces largely define the decisions about what cultural resources to preserve and how to preserve them (Avrami et al., 2000), climate change adds an additional layer of complexity to cultural resource management. Hence, more research is needed to assess the competing values of diverse stakeholders and decision makers, as well as address the interconnected environmental, socio-cultural and economic challenges. These challenges, along with the unavoidable reality that not all cultural resources can be preserved in perpetuity, necessitate the use of processes that enhance transparency and foster defensible decision making.

### 1.2. The role of values in decision making

We argue, along with other authors (Brabec and Chilton, 2015; Carmichael, 2015; Daly, 2014; Mitchell and Barrett, 2015), that recognition of a shared heritage can minimize conflicts of interest among diverse stakeholders and result in more effective preservation or adaptation planning of cultural resources. However, few studies seek to understand how decision-makers’ and stakeholders’ values can guide and provide support for preservation and adaptation of cultural resources (Fatorić and Seekamp, 2017). This study therefore contributes to fill this important gap in research field.

The term “value” has roots in social sciences and it has become an essential part of studies on environmental problems and concerns (Dietz et al., 2005). Values are defined as “concepts or beliefs about desirable end states or behaviors that transcend specific situations, guide selection, or evaluation of behavior and events and are ordered by relative importance” (Schwartz and Bilsky, 1987:551). Dietz (2013) argued that people have to focus their attention on identifying value differences and designing processes that allow articulation of and reflection on values in the light of decision-making process. We acknowledge that decisions taken in the absence of such values may result in strategies and policies that do not promote sustainability and societal goals, might exacerbate educational inequalities and might not build governance and institutional capacity to anticipate and respond to climate change. Thus, value-focused thinking and structured, analytic-deliberative approaches have been advocated as frameworks to enhance informed decisions by enhancing the scope of deliberations and decision opportunities (Gregory et al., 2011; Runge et al., 2013).

We propose structured decision making (SDM) as an approach that can robustly capture the complexity of individuals’ values, concerns, priorities, preferences and opportunities necessary in adaptation planning (e.g., Gregory et al., 2011; Ogden and Innes, 2009; Runge et al., 2013). The SDM approach is rooted in decision analysis and behavioral decision theory (Gregory et al., 2011; Runge et al., 2013), and it is considered a transparent and collaborative approach for supporting more informed and durable decisions (Irwin et al., 2011). The SDM approach can balance multiple objectives based on participants’ values (these drove the decision analysis) and given various constraints and uncertainties (e.g., economic constraints, scientific uncertainties, laws and regulations, institutional norms, power relationships). It recognizes the distinction between value-based information and technical information while explicitly integrating both (Conroy et al., 2008; Gregory and Keeney, 1994; Johnson et al., 2015). The SDM approach can rigorously evaluate options for decision problems that are controversial or that lack scientific and technical data (Ferguson et al., 2015), such as cultural resource climate adaptation planning. The SDM process allows a decision context to be broken into six essential components (Fig. 1): (1) structuring a clear problem statement; (2) defining participants’ values and objectives; (3) developing alternative actions in order to achieve defined objectives; (4) evaluating consequences of alternative actions; (5) evaluating tradeoffs among alternative actions; and (6) transparently choosing optimal decision(s) (i.e., that which gets us closest to defined objectives) (Runge et al., 2013).

Although an SDM approach has been increasingly applied in the context of decision problems in wildlife and endangered species conservation and ecosystem-based management (e.g., Conroy et al., 2008; Espinosa-Romero et al., 2011; Ferguson et al., 2015; Irwin et al., 2011; Johnson et al., 2015; Martin et al., 2009; Ogden and Innes, 2009), there is a considerable lack of studies applying SDM approach in the context of climate change adaptation of socio-economic system such as cultural resources. We argue that testing the utility of an SDM approach in the context of climate adaptation planning for cultural resources is warranted, as the loss of culturally significant physical assets is permanent and these assets are imbued with meanings to past, present and future generations. As such, an SDM approach can foster transparency of valued-based decisions (Marcot et al., 2012).

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