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Picturing a place by the sea: Geovisualizations as place-based tools for collaborative coastal management

Robert Newell*, Rosaline Canessa

Department of Geography, University of Victoria, 3800 Finnerty Rd, Victoria, BC, V8P 5C2, Canada

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ABSTRACT

Effective coastal management is integrative and aims to incorporate the wide variety of user needs, values and interests associated with coastal environments. This requires understanding how different user groups relate to coastal environments as 'places', imbued with values and meanings, rather than simply 'spaces'. Accordingly, tools and techniques that can capture and convey place-based information have potential for supporting coastal management strategies. This suggests a role for geovisualizations that inclusively reflect the range of values and meanings through immersion and realism. The current paper aims to advance coastal geovisualization research by firstly, examining relationships with, understandings of, and behaviours toward coastal places, and secondly, using this insight to create recommendations for building geovisualizations that can effectively facilitate collaboration among conflicting user groups. The paper identifies different coastal user groups using a cultural model framework, and through a review of previous research on coastal communities, it examines how the values and interests of these user groups influence understandings and perceptions of coastal places. Recommendations for geovisualizations emerging from this research include full navigability, dynamic elements, and flexibility in the way that they allow for continual modification and scenario building.

1. Introduction

Effective coastal management requires integrated approaches, which recognize that coasts consist of complex land-to-ocean environments and are layered with interacting ecological, social, economic, and cultural dimensions (Bowen and Riley, 2003; Fletcher and Potts, 2008; Christie, 2005; Sorensen, 1997). Engaging in such integrated approaches requires that competing values, interests, and associated lifestyles must be addressed and reconciled collaboratively by bringing stakeholders together (Bowen and Riley, 2003), while also ensuring that people are cognizant of the fact that coasts comprise interconnected terrestrial and marine environments (Sorensen, 1997). Such considerations are interrelated because different values, interests, and lifestyles can affect how people relate to coastal environments in terms of its land and ocean properties (Shackeroff et al., 2009). Therefore, in order to enact effective coastal management strategies and governance approaches, one must understand how different users' values, interests, and needs influence their perspectives and understanding of these marine-terrestrial environments. This requires thinking of these environments as 'coastal places', rather than simply 'coastal spaces'.

'Place' is a subjective representation of a locality that captures the values, meanings, and identities ascribed to that locality (Bott et al., 2003). 'Space', or the physical dimensions of a locality, becomes a place when it is imbued with values and meanings (Tuan, 1977). It is through the place perspective that people form understandings of and feelings toward their environment, or their 'sense of place', and these understandings/feelings frame their behaviour toward and within the environment (Bott et al., 2003). Therefore, in terms of coastal management and governance, considering coastal environments as 'places' is necessary for identifying different understandings of the coast, which in turn, is essential for determining how to reconcile the range of user needs and interests in a manner that is sustainable for both coastal communities and ecosystems. However, capturing place-based values in coastal management can prove challenging. Places can have 'fuzzy' boundaries, creating difficulties for defining exactly where certain values are ascribed to, and such values can be expressed in vague terms that do not necessarily translate to

* Corresponding author.
E-mail addresses: rgnewell@uvic.ca (R. Newell), rosaline@uvic.ca (R. Canessa).

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concrete management outcomes (Newell and Canessa, 2015a). Thus, developing innovative tools that capture and communicate place-based information is important for advancing coastal management practices and governance approaches.

Conventional maps have the ability to clearly communicate spatial information; however, they can be abstract and ineffective in characterizing and conveying place-based meanings and understandings and (thus) do not always encourage inclusivity in management approaches (Lewis and Sheppard, 2006). Capturing and communicating place information requires the use of more sophisticated visualization techniques that allow diverse groups to understand geographical representations and relate to the represented environmental settings. Advancements in three-dimensional technology have created new opportunities for creating immersive, realistic visualizations that allow people to recognize environments in terms of being a 'place' (Newell and Canessa, 2015a) and provide first-person perspective glimpses of different scenarios applied to a familiar locality (Sheppard, 2001). This form of visual media interacts with people's sense of place, which positions it as a potentially powerful tool for facilitating collaborative resource planning and management (Newell and Canessa, 2015a). Previous research supports this notion by observing that realistic geographical visualizations, referred to in this paper as geovisualizations[1], have shown promise for functions, such as effectively communicating resource development outcomes with local communities (Lewis and Sheppard, 2006), collaborative climate adaptation planning (Schroth et al., 2009; Sheppard et al., 2011), and facilitating collaboration amount conflicting land-use interests (Schroth et al., 2011).

Although geovisualization research has demonstrated that such tools have potential for facilitating collaborative planning, insights gained and lessons learned from this work thus far have been primarily in the terrestrial context and research on the use geovisualizations in the coastal context is currently in its infancy. The coastal context differs from the terrestrial in that it involves varying place relationships with different aspects of the marine-terrestrial continuum; therefore, lessons/insights from terrestrial work are not directly applicable to coastal geovisualizations. The current paper aims to address this research gap by investigating the considerations that are specific to the coastal context when developing and using geovisualizations as tools for collaborative planning among diverse stakeholders. The research takes a place-based approach by examining different needs and interests associated with coastal places, how these needs/interests influence perspectives around and behaviour toward coasts, and how geovisualizations can be developed and used for enhancing coastal understandings and facilitating collaboration among conflicting user groups. The study employs Thompson (2007)'s coastal cultural model framework to define different user groups, and uses these defined groups to examine how values and interests can influence understandings and conceptualizations of coastal places. These understandings and conceptualizations were then examined to elucidate considerations around developing geovisualizations as tools for effectively facilitating collaborative coastal planning, which subsequently informed recommendations for features that should be incorporated into these tools.

2. Methods

This study employed a structured literature review methodology (Armitage and Keeble-Allen, 2008), involving a review of studies that were strategically selected through the use of predefined conceptual framework. The conceptual framework consisted of Thompson (2007)'s seven cultural models of coastal property, and it was selected because Thompson (2007) specifically developed these models to illustrate how different values and interests for coastal places can lead to coastal user conflicts. Due to this capturing of coastal social diversity and (resulting) conflict, the framework served an appropriate point of departure for a place-based study focused on developing tools (i.e., geovisualizations) for reconciling varied interests and increasing collaboration in coastal management efforts.

The review process began by identifying the key features of a given cultural model as described by Thompson (2007), in terms of coastal values and interests that are expressed through the model. These features were cross-referenced through a review of Stocker and Kennedy (2009), who applied Thompson (2007)'s model to the Australian context. Once the features were identified, a literature search was conducted to identify theoretical and empirical works that discuss and provide examples of the different user groups (as defined through the cultural models). The literature was reviewed, and this enabled syntheses of coherent 'impressions' of the ways different coastal users understand and relate to the coast.

After understanding how user groups understand/relate to the coast, 'conceptualizations of coastal places' were developed for each of groups, which refers to the ways different user groups imagine or mentally 'visualize' coastal places. This approach was selected as it allowed the researchers frame and interpret relationships with place in a manner that captures geometric and structural perceptions of coastal environments and thus was deemed appropriate for an exploration on geovisualization. The conceptualizations were developed by qualitatively analyzing the results of the literature review in terms of functional and/or symbolic associations coastal users form with various physical aspects of coastal environments, and then determining what the perceptual foci and conceptual inclusions/exclusions of different coastal features might be based on this analysis.

Once the conceptualizations were developed, they were compiled into a table and examined in terms of them representing the 'imagined places' of different stakeholders within coastal planning sessions. The examination specifically involved identifying where potential conflicts and tensions could arise due to different ways the coast is imagined among different user groups, deficiencies or gaps in perceptions of what constitutes a coastal environment, and misalignment between imaginings of coastal places and (possible) coastal management objectives. This analysis elucidated several considerations around developing coastal geovisualizations as a tools for supporting planning processes and addressing said conflicts/tensions, which in turn, led to development of recommendations for building coastal geovisualizations.

In order to better illustrate the findings and recommendations from the research, sample images of a geovisualization case study are included in this paper. The geovisualization was built as part of a larger research project on coastal geovisualizations, and it modelled the coastal environment of a Canadian national park located in British Columbia (Fig. 1) using a combination of ArcMap (v. 10.3.1), Adobe Photoshop (CS5), and Unity 3D (v. 5.3.4) (Newell and Canessa, 2015b). The specific location and geographical context of the modelled area are not discussed in detail here because the sample images serve as visual complements for recommendations that are intended for geovisualizations that represent a variety of coastal places.

Several considerations arise when employing this methodology that are important to note as they affect how the results of this study are interpreted and applied. Firstly, cultural models are not mutually exclusive, meaning that an individual can hold characteristics associated with multiple cultural models (Thompson, 2007), and in some cases, certain cultural models can 'overlap' (i.e., have a strong relationship) with other models (examples discussed below). Therefore, the purpose of employing a cultural