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REPORT

CONTESTED VALUES AND PRACTICES IN COASTAL ADAPTATION TO CLIMATE CHANGE

THE ROLE OF SOCIO-CULTURAL CONSTRUCTION IN DECISION MAKING FOR ADAPTATION TO CLIMATE CHANGE AND SEA LEVEL RISE IN THREE US STATES

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RADOST-Berichtsreihe
Bericht Nr. 18
ISSN: 2192-3140

SPONSORED BY THE
Federal Ministry of Education and Research
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A dissertation submitted in partial fulfilment of the requirements for the MSc Environment and Sustainable Development at the Development Planning Unit, University College London

RADOST-Journal Series
Report No. 18

ISSN: 2192-3140

Berlin, Mai 2013

Acknowledgements

I would like to express my sincere gratitude to Grit Martinez (Ecologic Institute) and Dennis Bray (Helmholtz-Zentrum Geesthacht) for providing me the exceptional opportunity to participate in their research. Without their invaluable support and thoughtful comments throughout my dissertation writing, this thesis would not have been possible. My special thanks go to the rest of the staff of Ecologic Institute who have assisted me in compiling the data for this analysis. I am truly thankful to my supervisor David Dodman (International Institute for Environment and Development) for the support and guidance he showed me. I would like to thank Adriana Allen and the rest of the staff at the Development Planning Unit, UCL, for their inspiration and encouragement in defining my research topic. My deepest thanks go to my family and friends for their incredible support throughout the year of my MSc studies at the Development Planning Unit, UCL.

List of Acronyms

ABC	Audit Bureau of Circulations
AEC	Areas of Environmental Concern
CCS	Chesapeake Coastal Service
CELC	Coastal and Estuary Land Conservation Program
CSC	Coast Smart Communities
CAMA	North Carolina Coastal Areas Management Act
CTWA	South Carolina Coastal Tidelands and Wetlands Act of 1977
CZMA	Coastal Zone Management Act of 1972
DHEC	South Carolina Department of Health and Environmental Control
DNR	Maryland Department of Natural Resources
EPA	Environmental Protection Agency
IPCC	Intergovernmental Panel on Climate Change
MD	Maryland
NOAA	National Oceanic and Atmospheric Administration
NC	North Carolina
NCAC	North Carolina Administrative Code
NCCRM	North Carolina Coastal Coastal Resources Commission
SEC	Shore Erosion Control Plan
SC	South Carolina

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1 Introduction

Adaptation to climate change requires the implementation of new and revision of existing policies in order to change collective behaviour in a way that reduces vulnerability to the impacts of climate change. At the same time, the efficiency of environmental governance has been questioned due to perceived deficiencies in implementation in the past. As a consequence, it is observed that high levels of *adaptive capacity* are often not used for *adaptive action*, and therefore communities remain vulnerable. Current adaptation research suggests that explanations for this 'adaptation gap' can be found in conditions of institutional structure and agency. By contrast, less attention has been given to the *socio-cognitive dimension* of adaptation (cf. Burton et al., 2009; Grothmann & Patt, 2005; O'Connor et al., 1999; Rayner, 1998).

This thesis is looking at the socio-cognitive dimension of adaptation from the perspective of socio-cultural construction of values and practices that influence risk perceptions and behavioural intentions in coastal management and adaptation to climate variability and change. The construction of values and practices is analysed through discursive fields on the respective topics in local media from three states on the US mid-Atlantic coast. Four major spaces of contestations over divergent opinions on climate change and coastal management are identified. The implication of locally different manifestations of these contestations for implementation of adaptation strategies responding to sea level rise, coastal change, and climate change are analysed based on a survey amongst decision makers in the three states. Culturally embedded opportunities and constraints in implementation of climate change adaptation strategies are identified and recommendations are made for further research on adequate framing of such strategies.

1.1 Conceptual Framework

1.1.1 Definitions

The IPCC defines adaptation as 'the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities' (IPCC, 2007, p. 6). For the purpose of this study, however, it is useful to distinguish between adaptation to naturally occurring extreme events and to man-made climate change. Satterthwaite et al. (2009, p. 9) differentiate *adaptation to (human-induced) climate change* as 'actions to reduce the vulnerability of a system..., population group...or an individual or household to the adverse impacts of anticipated climate change due to the emission of greenhouse gases', and *adaptation to climate variability* as '[consisting] of actions to reduce vulnerability to short-term climate shocks (with or without climate change)' (Ibid.). *Adaptive capacity,* as defined by the same authors, is the 'inherent capacity of a system..., population...or individual/household to undertake actions that can help to avoid loss and can speed recovery from any impact from climate change' (Ibid.). The distinction between adaptive capacity and adaptive action is outlined by Pelling (2011, p. 21): 'Capacity drives scopes for action, which in turn can foster or hinder future capacity to act.'

Adaptive capacity both reduces vulnerability and is part of it. Cutter & Emrich (2006, p. 103) distinguish biophysical vulnerability from social vulnerability, the latter to be understood as 'the susceptibility of social groups to the impacts of hazards, as well as their resiliency, or ability to adequately recover from them' (cf. also Pelling, 2011). The combination of both

biophysical and social vulnerability is what causes diverse patterns of *riskscapes* (Cutter et al., 2000, p. 716).

1.1.2 The socio-cognitive dimension in adaptation to climate change

While several studies have identified crucial gaps in knowledge creation and communication of risks from climate change (cf. Adger et al., 2005; Corfee-Morlot et al., 2011; Meinke et al., 2006; Moser & Dilling, 2011; Parson et al., 2003, p. 11; Smit & Pilifosova, 2001; and others, summarised in Appendix I), they don't explain the entirety of factors that determine a decision maker's intention to act. In fact, the assumption that knowledge production, communication, risk perception, and willingness to act is a uni-directional process has been proved wrong in numerous case studies (cf. Heimann & Mahlkow, 2012; Leiserowitz, 2007; Tribbia & Moser, 2008; Vogel et al., 2007). Particularly in the US, surveys have revealed a discrepancy between perceived risk and urgency to act (Dilling & Moser, 2007). As a result, adaptive capital is not being used to reduce vulnerability (Moser et al., 2008). Moreover, cross-cultural and cross-sector comparisons have shown that similar knowledge about risks triggers different reactions in different actor groups (cf. Heimann & Mahlkow, 2012; Sonnett, 2010).

These findings indicate that perception of risk and adaptive capacity is a decisive factor in decision making for climate adaptation. Perceptions of climate risk are the outcome of the socio-cultural construction of knowledge, based not only on scientific data but moreover on social networks, power relationships, and *biases of the knower* (Castree, 2001, p. 10; Bourdieu, 1983). Knowledge of climate risk is the 'shared belief of what reality is', formed through social interaction (Heimann & Mahlkow, 2012, pp. 2-3). This implies that those who dominate social communication structures have the strongest influence on the construction of collective knowledge (Bourdieu, 1983; Castree, 2001; Heimann & Mahlkow, 2012).

What results from the above is that there is a constant struggle over power in the construction of knowledge, '[which is] in itself an act of mobilisation' (Bourdieu, 2005, p. 39). Individuals and organisations constantly contest over definitions (*positions*), and claim legitimacy for their visions based on the power (*capital*) they possess (cf. Bourdieu, 2005; Robbins, 2000; Bourdieu, 1996). According to Bourdieu (1996, 2005), power can be expressed in economic capital, or in *symbolic power* or *cultural capital*, such as journalistic practices (Benson & Neveu, 2005, p. 4) or linguistic resources (Sonnett, 2010). Cultural capital exists only as an outcome of the social construction of meanings and values (Bourdieu, 1983, p. 319). In summary, collective perceptions of climate risk can be described as the outcome of a power struggle amongst different communities, each of which has its own discourse on the topic (cf. Heimann & Mahlkow, 2012; Sonnett, 2010; Leiserowitz, 2007), shaped by values and practices or culture[1].

1.1.3 Culture and behavioural attitudes towards adaptation

The way in which communities form different perceptions of risk and preferences for action is therefore intrinsically linked to culture, expressed through values and practices (cf. Hofstede & Hofstede, 2005). If current values and practices are averse to taking adaptive action, a cultural change might be the only condition under which the adaptation gap can be closed. Changes in practices can be triggered in a relatively short amount of time by scientific

[1] Culture is manifested in both values and practices, and at the same time values and practices reinforce culture (Hofstede & Hofstede, 2005).

findings, whereas changes in values take several generations (Hofstede & Hofstede, 2005, pp. 12-13, 17). As a relatively new area of research, findings on the causes and implications of climate change therefore have little chance to trigger comprehensive cultural change. However, communities also have a long history of dealing with weather extremes, and cultural constructions of both values and practices have changed accordingly (Oliver-Smith & Hoffman, 2002). As a result of different exposure to environmental hazards, communities have developed different strategies to respond to them by '[adapting] along a number of fronts, ecologically, socially, and ideologically' (Oliver-Smith & Hoffman, 2002, p. 7).

'[Radical] transformations...can only result from the transformations of relations of force constitutive of the space of positions...' (Bourdieu, 1996, p. 234). Cultural differences in perceptions and attitudes can therefore be conceptualised as the outcome of the artificial construction (and deconstruction) of opposing positions on climate risk and vulnerability, as well as of strategies to defend these positions and to act upon them, to which different values have been assigned over time based on the symbolic and economic power held by various interpretive communities (cf. Bourdieu, 1996, p. 234; Sonnett, 2010).

1.2 Study area

The way in which cultural differences in some of the elements influencing risk perceptions are manifested in discourse on climate change has been demonstrated particularly in comparison of media discourse at the international level (cf. Brossard et al., 2004; Heimann & Mahlkow, 2012) and across communities of interest (cf. Leiserowitz, 2005; Sonnett, 2010), but less so in relation to the social construction of adaptation governance in coastal areas[2]. However, research on coastal areas can provide particular insights into the socio-cultural construction of adaptation to climate change because of their extensive experience in adaptation to climate variability and coastal change (cf. Moser et al., 2008). 'The first reason for cultural diversity has been adaptation to new natural environments' (Hofstede & Hofstede, 2005, p. 16). Hence, complex ecosystems such as coastal areas provide conditions in which cultural manifestations have been informed by constant adaptation to climate variability and coastal change.

As long as coastal resources have been valued for multiple uses, issues of environmental deterioration and resource use conflicts have been a concern in coastal areas. Their management has been challenging, not only because of expressed cross-scale interactions and overlapping management responsibilities amongst multiple authorities and private owners (Kay & Alder, 2005), but also because the functioning of vulnerable and diverse coastal ecosystems is far less understood than that of terrestrial ecosystems (Kay & Alder, 2005, p. 12). While natural coastal systems are considered resilient due to their diverse and dynamic structure, land claim and shoreline stabilisation have disrupted natural processes and made coastal systems more vulnerable (cf. Klein et al., 2003; Dean, 1999; Kana, 2010). As a consequence, coastal areas have been confronted with the need to embrace high levels of uncertainty even without taking into account human-induced climate change (Tribbia & Moser, 2008). At the same time, research in these areas is especially relevant considering the disproportionate exposure of the global population to climate change impacts in coastal areas (McGranahan et al., 2007).

[2] Cf. Heimann & Mahlkow (2012) for ongoing research on this topic.

These conditions of vulnerability are exacerbated by climate change. The most certain impacts from climate change (sea level rise and temperature rise) are directly affecting coastal areas, modifying water tables, estuary salinity, and beach topography (Nicholls, 1995). Together with less predictable impacts such as shifting rainfall patterns and storm activities, these impacts are likely to have detrimental implications for access to infrastructure, land, and resources. Meanwhile, power relations in the existing political economy tend to create patterns of vulnerability that push poor communities to hazardous areas, creating a positive feedback loop of socio-economic inequality (Manuel-Navarette, 2011; Nicholls, 1995).

All of the above holds true for the US mid-Atlantic coast (cf. Appendix IV.1 for a map of the study area). Expected impacts from climate change will exacerbate existing vulnerabilities rather than create new ones. Sea level rise has been observed in the past, and coastal storms have had devastating impacts in recent years. Because of the coast's shallow profile, ongoing sea level rise is having a considerable effect along the mid-Atlantic shoreline, particularly in areas where land subsidence has occurred (Kana, 2010, pp. 4-5; Karl et al., 2009, p. 37). In Maryland, relative sea level rise has been observed at a rate of 3-4 mm per year, double the global average rate (Johnson, 2000). In the Carolinas, sea level has risen by 2-3 mm per year over the past century (Kana, 2010, p. 5; NCCRC, 2010, p. 6). These rates will accelerate as global sea level is expected to rise by up to more than 1.2 m by 2100 (Karl et al., 2009, p. 25). Nevertheless, hurricanes have been the main source of coastal physical vulnerability[3] in most coastal communities in the past (cf. Boruff et al., 2005; Kana, 2010)). Their impacts are likely to increase as the intensity of Atlantic storms is expected to be augmented by rising sea surface temperatures (Karl et al., 2009, pp. 68, 112). In addition to impacts at the immediate shoreline, coastal storms involve hazards affecting inland areas, such as heavy rainfall or heavy winds. In 1999, hurricane Floyd led to severe flooding in low-lying inland areas in North Carolina and forced residents to seek shelter at the less-impacted coast (cf. Kana, 2010, p. 26).

In spite of the natural variability and associated environmental hazards in coastal landscapes, people have long been attracted by them and have found different ways of managing the risks. Common defence strategies have often changed the natural balance of coastal processes in unexpected ways though (cf. Kana, 2010; Dean, 1999). As a result, coastal protection is becoming increasingly costly (Karl et al., 2009), and uneven *riskscapes* have emerged from socio-economic structures.

1.3 Research questions

The increasing focus on values and cultural construction in adaptation research has been triggered by a persistent gap in implementation of adaptation strategies on the ground despite adaptive capacities available in the form of knowledge, experience, and economic capital. While a lot of research has been done on the cultural barriers in knowledge construction and risk perception at the national level, less attention has been given to the specific socio-cultural conditions in coastal regions where, in spite of a long history of adaptation to coastal change, strategies for adaptation to climate change are poorly

[3] Physical coastal vulnerability is the outcome of a combination of environmental risks, including hurricane landfall probability, exceedance probability for category 1 hurricane winds, beach erosion, and sea level rise (Boruff et al., 2005).

implemented. This raises two questions to be addressed in this dissertation. The first research question is:

In what ways are general environmental beliefs, climate risk perception, and climate knowledge in coastal areas culturally constructed?

The findings under this question allow identification of several key spaces of contestation in which perceptions of climate change and the need for adaptation are currently shaped. Their implication for implementation of strategies is addressed under the second research question:

In what ways are cultural differences in environmental beliefs, risk perceptions, and knowledge reflected in behavioural intentions and decision making for coastal adaptation to climate change?

1.4 Methods

Socio-cognitive elements defining decision making in coastal adaptation were identified from a literature review. Cultural differences in these elements have been assessed in a quantitative content analysis of public discourse in the *sub-field* (Bourdieu, 1983, p. 324) of local journalism based on the coding scheme developed by McComas & Shanahan (1999). Three local newspapers were analysed based on Bourdieu's field theory. Each newspaper represents a particular constellation of interpretive communities defending their positions by employing economic and cultural capital. These communities are not place-specific; however, the constellation represented by each newspaper can be considered to have considerable influence in their respective areas in terms of outreach since newspapers were selected based on circulation numbers.

Newspapers analysed under this method were *The Capital* (published in Annapolis, Maryland), *The Herald Sun* (published in Durham, North Carolina) and *The Post and Courier* (published in Charleston, South Carolina; cf. Appendix II for a description of their respective areas of outreach). Articles were selected by key words on climate change and coastal risk management as well as by time of publication (between 12 July 2011 and 12 July 2012). The search was carried out through Nexis® UK for *The Herald Sun* and *The Capital* and the newspaper's website for *The Post and Courier*. The search returned 248 articles (114 in *The Capital*, 58 in *The Herald Sun*, and 76 articles in *The Post and Courier*), out of which 120 (58, 25, and 37, respectively) were analysed after double returns and articles with no reference to the topic had been discarded[4].

Based on themes[5] identified by McComas & Shanahan (1999) and Brossard et al. (2004), a selection of articles was screened for main themes and sources indicating the elements that influence willingness to adapt identified in the previous section. Articles were then analysed by coding each theme identified as *absent*, *present*, or *outstanding focus* (cf. Appendix II for a more detailed description of methods and themes). Based on the quantitative analysis of themes, key spaces of contestation were identified in which elements of willingness to adapt are currently constructed.

[4] In these articles, the key words had been used in metaphorical senses, but otherwise did not refer to the topic.

[5] 'Themes' within this method indicate components in the construction of narratives, e.g., the theme 'scientific controversy' indicates that a topic was reported as contested amongst scientists.

Influences of cultural differences on coastal zone management in the study area were identified from a literature review and a survey amongst decision makers on coastal management. The survey was carried out by the Nicolas School of the Environment at Duke University and Ecologic Institute during three workshops held in Annapolis, Maryland, Beaufort, North Carolina, and Charleston, South Carolina in April 2012. Questions addressed public behaviour and attitudes in response to coastal change and towards adaptation to climate change. Participants included representatives from local governments, state agencies for environmental management, and the states' universities. The data were collected as part of an ongoing research project on cultural differences in coastal management and adaptation to climate change in the Baltic Sea Region and the US mid-Atlantic coast and kindly provided by the authors of the survey for the purpose of this thesis.

1.4.1 Limitations

Limitations arise from the data used for this thesis. The data and methods used enabled identification of local and regional differences in both cultural constructions and their implications as examples, but these are by no means representative. Most importantly, the newspapers chosen can and should not be mistaken as representative of the dominant views in the respective states. They are merely illustrative examples of local journalistic fields representing a limited number of interpretive communities. The comparability amongst the newspapers is further reduced by geographical differences in their respective areas of outreach and their associated different exposure to change. Moreover, during the time period analysed, discourse was heavily influenced by campaigns for upcoming presidential elections in November 2012, which might have contributed to exceptionally politicised narratives in the articles analysed. Furthermore, a strong bias in the analysis is inevitable due to the author's own beliefs and values and associated interpretation of the material analysed. In an ideal application of the method, coding should be carried out independently by various researchers. In addition to the above, small sample sizes account for limited representation of the survey data, with only 8 participants in North Carolina.

2 Socio-cultural construction of willingness to act for adaptation to climate change

2.1 Elements that influence willingness to adapt

Over the past few years, a decline in public interest and awareness of climate change has been observed in the US. This has triggered intensive research on cultural perceptions and communication of risk in the context of climate change (cf. Hoffman, 2012). In this context, an ongoing study on public perceptions of climate change in the US has identified six interpretive communities, ranging from *naysayers* to *alarmists* (Maibach et al., 2011). Their diverging interpretations of climate risk are not only constructed from wider environmental beliefs (cf. O'Connor et al., 1999), but also by their social environment (Thompson & Rayner, 1998, p. 336).

As perceptions of climate change are socially constructed, so are intentions to act. This is mainly because the constructed reality defines the perceived need for action;but also, action acquires legitimacy through shared visions that support this perception (Hoffman, 2012; Rayner & Malone, 1998, p. 84). **Visions,** or what Hofstede & Hofstede (2005) define as the *desirable,* are values that express what is ethically right. Visions are therefore amongst the most critical barriers to change (Hoffman, 2012, p. 32; Moser & Dilling, 2007, p. 504). Next to these, more practical **values** of what is beneficial (i.e., the *desired*) define positions on climate change and preferred action (cf. Hofstede & Hofstede, 2005; Hoffman, 2012). Both visions and values are at the core of what defines culture (Hofstede & Hofstede, 2005; Oliver-Smith, 2002, p. 30).

'[Recognizing] the causes of global warming is a powerful predictor of behavioural intentions' (O'Connor et al., 1999, p. 469). **Knowledge construction** reinforces both cultural values and supported positions as 'we'll consider evidence when it is accepted...by a knowledgeable source from our cultural community; and we'll dismiss information that is advocated by sources that represent groups whose values we reject' (Hoffman, 2012, p. 32). In the context of the US and Northern Europe, general public and coastal decision makers have been found to retrieve information on climate change to a large extent from (mass) media (cf. Martinez & Bray, 2011; Moser & Dilling, 2011; Tribbia & Moser, 2008).

Constellations of societal fields additionally influence local preferences for strategies in adaptation to climate change (Heimann & Mahlkow, 2012, p.10; Leiserowitz, 2005, p. 1441; Rayner & Malone, 1998). **Power** is the more evident force in this constellation, but equally important is **trust**. Challenges remain in building trustful relationships between science and policy makers, for instance in determining the legitimacy of knowledge (Vogel et al., 2007, p. 353). While scientists' professional culture and standards of conduct tend to emphasise elements of uncertainty, this does not reflect political values and practices and contributes to an 'erosion' of trust in science (Dilling & Moser, 2007, pp. 8-9).

Finally, according to Moser et al. (2008, p. 3), there are two incentives for policy makers to take action on adaptation to climate change. First is the moral imperative of reducing people's and ecosystem's vulnerability, and second is the economic imperative of reducing the vulnerability of infrastructure and the economic sector. The **perception of risk and vulnerability** is therefore another very important element in addressing climate change. In part, this perception is formed based on personal experience of extreme weather events (cf. Oliver-Smith & Hoffman, 2002; Weber, 2006); however, assessing the construction of

perceptions of risk from climate variability and change is complex (cf. Beck, 2007, p. 28; Oliver-Smith, 2002, p. 39). Disasters may even lead to mal-adaptation or close any windows of opportunity to implement long-term adaptation strategies (Moser & Dilling, 2007, p. 496). Moreover, a strong trust in technology or management capacity can lead to an overestimation of one's adaptive capacity (Heimann & Mahlkow, 2012, p. 10).

2.2 Cultural differences in the discursive construction of willingness to adapt

Narratives on climate change that appear in newspapers do not only contribute to the knowledge construction amongst readers, but more importantly reflect available positions on climate change that distinguish interpretive communities (cf. Sonnett, 2010, p. 699). Articles from three local newspapers analysed in this study illustrate different constellations of communities who share values and defend them by taking positions on coastal management and climate change. Communities represented in the newspapers are characterised by different geographical settings and histories of socio-economic development (cf. Appendix II.1). In the method used (cf. Appendix II.2), identifying discursive themes indicates the positions that are available. Also, quantifying their appearance reveals the distribution of power in defence of these positions and the different spaces in which these available positions on different topics exist. Communalities indicate similar constellations in the construction of positions across all communities represented by the papers, whereas differences indicate particularities within the area of outreach of each newspaper.[6]

2.2.1 Themes and general trends in local media discourse

Following the method described in Appendix II.2, key themes were identified from the newspapers' discourse on climate change and coastal management. An overview of the themes identified is presented in Table 1 and in more detail in Appendix II.2. The combined results are presented in Figures 1 and 2, and detailed results by newspaper are given in Appendix II.3.

The results for themes on values demonstrate an abundant focus on environmental values, followed by economic, and lastly social values as a general tendency across all newspapers (cf. Figure 1a). Generally, visions could less often be identified than values, and amongst them the theme 'American Way' was found less often than that of 'Sustainability' (cf. Figure 1b). A noticeable difference was observed, however, in the individual results per newspaper (cf. Appendix II.3), e.g., visions were more often referred to than values in *The Herald Sun*.

[6] Neither communalities nor differences can however be generalised beyond the communities represented in each newspaper, i.e., the respective readers, journalists, and sources.

Political sources appeared most frequently in all three newspapers, followed by local residents and academic sources. Further sources cited included representatives of business and environmental groups. The results demonstrate a considerable hierarchy in who is considered to have a legitimate opinion or knowledge on climate change and coastal management, which consequently has influence on the construction of available positions on the themes analysed[7] (cf. Figure 1c).

'Scientific facts' was the theme most often reported on trust. The data further indicate a considerable level of scepticism towards public action compared to satisfaction (cf. Figure 2c). 'Scientific uncertainty' was reported more often than 'Scientific consensus' in all of the newspapers selected. In addition to these general trends, some differences can be observed in constellations represented in the different newspapers. While articles in *The Herald Sun* were centred on facts and their contestation in scientific and political disputes, articles from newspapers in the other two states showed a strong engagement with current politics and

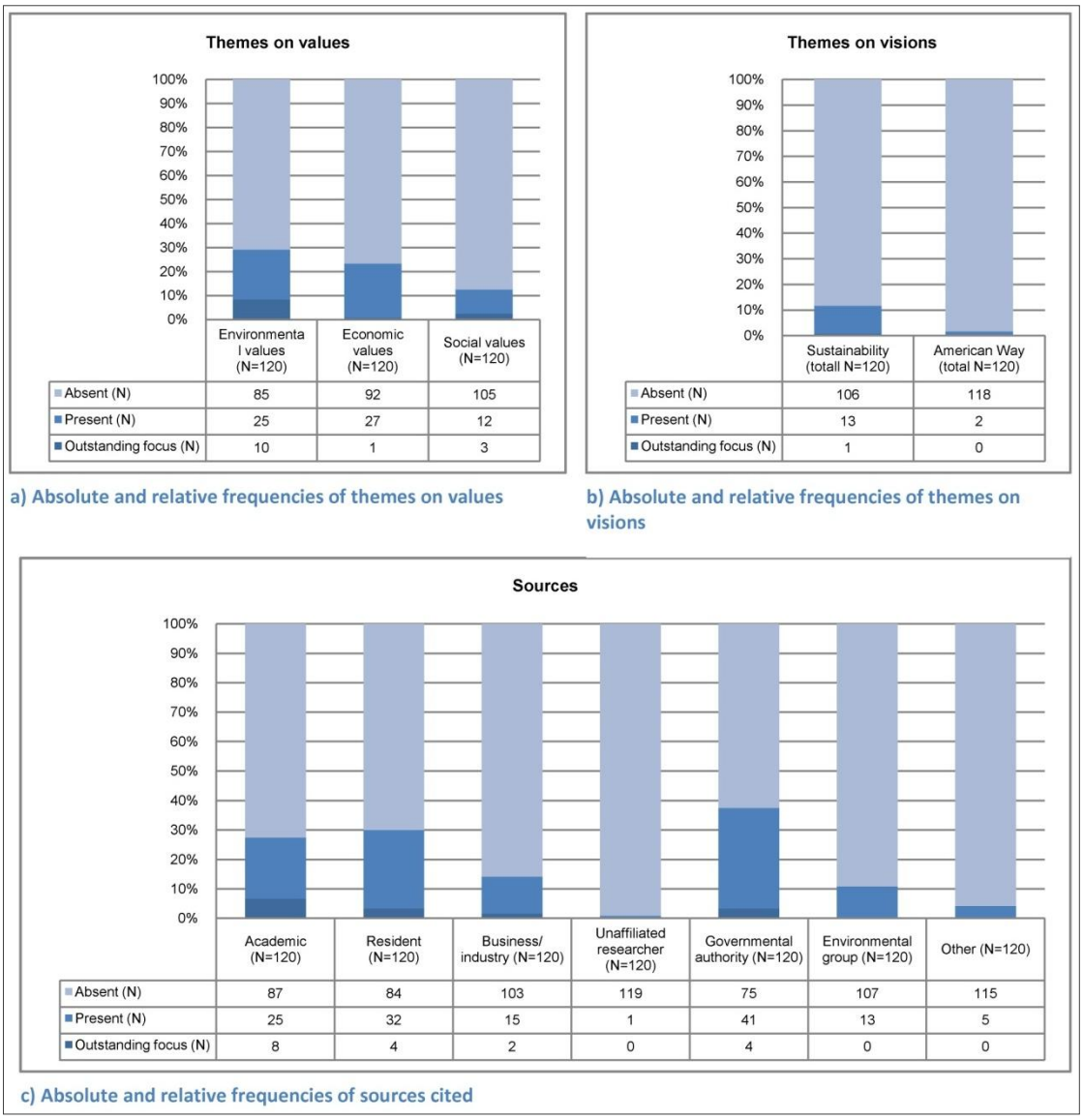


Figure 1 Combined frequencies of themes on values, visions, and sources cited in the local media. Source: own design

7 These results need to be treated with caution: particularly the category 'local residents' is very broad and would hide any bias towards certain stereotypes in the selection of 'local resident' sources.

management practices rather than scientific (un)certainty or political debate. In *The Capital*, these assessments were mostly positive, portraying current coastal and disaster risk management as effective and according to highest technological and methodological standards. By contrast, critique of current policies and their implementation outweighed positive statements in *The Post and Courier*. These results seem to reflect the local context, with more direct experience of environmental hazards amongst the communities represented in *The Capital* and *The Post and Courier* areas, and a strong presence of academia in the area of outreach for *The Herald Sun* (cf. Appendix II.3 for respective data and figures).

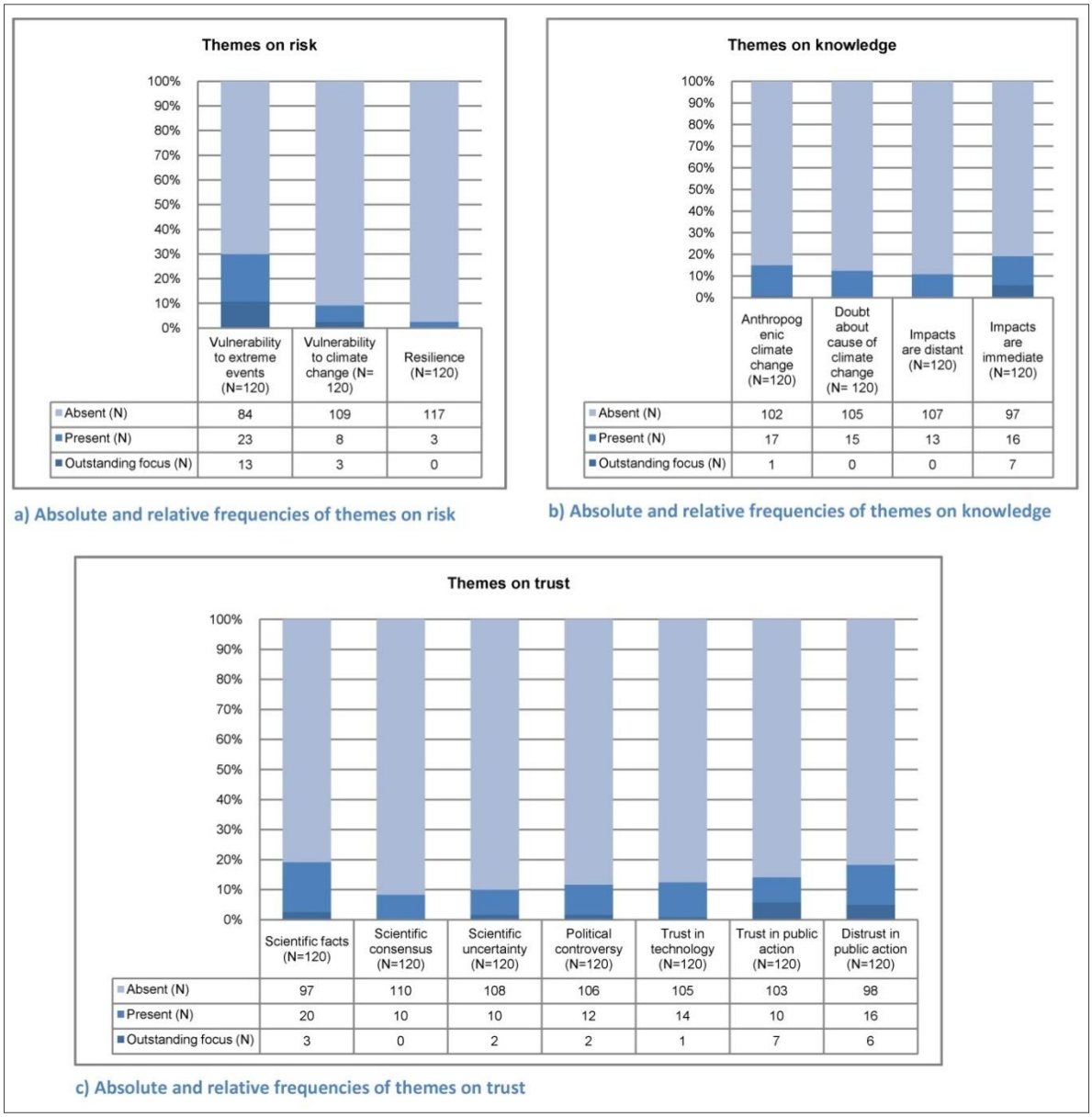


Figure 2 Combined frequencies of themes on risk, knowledge, and trust in the local media. Source: own design

Overall, the dominant theme on knowledge about climate change identified in all newspapers is that climate change is having 'Immediate impacts in time and/or space' (cf. Figure 2b). The theme 'Anthropogenic climate change' was the next theme most often reported on, followed by 'Doubts about cause of climate change', and finally the theme 'Distant impacts from

Table 1 Themes in the construction of willingness to adapt in local newspapers (The Capital; The Herald Sun; The Post and Courier). Source: own design

1	**Values**	
1a	Ecological values	Value of ecosystem as beauty of nature (use for leisure), vulnerable ecosystems need to be protected (from natural/ man-made environmental change), intrinsic value of nature
1b	Economic values	Cost-benefit of coastal protection/ adaptation
1c	Social values	Social cost-benefit of protection/ adaptation (e.g. employment opportunities)
2	**Vision/ Social norms**	
2a	Sustainability	Current lifestyle is not sustainable, fundamental change (e.g. in energy consumption, also in coastal management) is needed
2b	American Way	The American way of life is an individual right of Americans and common value
3	**Knowledge**	
3a	Anthropogenic climate change	Climate change is caused by human action and has (positive or negative) implications for science/ technology/ environment/ economy/ society
3b	Doubts about cause of climate change	It is not clear whether climate change is, or it is certainly not, caused by human activity; main causes for climate change are not GHG but other pollutants such as soot (and therefore produced by low income countries); Causes of climate change can be modified easily (through engineering); and require no change in way of life
3c	Distant impacts from climate change	Sea level rise in general (no implications for Atlantic coast specified)
3d	Immediate impacts from climate change	Climate change is having impacts already and current weather extremes could be related to or give an idea of further impacts from climate change; Climate change has positive local impacts; Local climate change impacts
4	**Risk**	
4a	Vulnerability to extreme events and sea level rise	Human loss to extreme events; economic loss to extreme events; Preparation for unpredictable events is needed; Current DRM, coastal protection and adaptation plans are not sufficient to create resilience to climate extremes and climate change; Infrastructure is vulnerable to weather extremes
4b	Vulnerability to climate change:	Climate change has impacts on human health; climate change increases risks from extreme events; causes sea level rise affecting the US Atlantic coast
4c	Resilience to coastal hazards/ climate change:	Adaptive action/ coastal protection is being (successfully) taken; threats are marginal/ no action required
5	**Trust**	
5a	Scientific facts	Scientific/ technical data presented
5b	Scientific consensus	There is unanimity among scientists that climate change is happening (and related to human cause)
5c	Scientific uncertainty and controversy	Climate scientists apply unorthodox practices, their credibility has to be questioned, more data is needed to be able to act/adapt
5d	Political controversy	Climate is a topic of political dissent; used in political campaign
5e	Trust in technology	Technology for protection from coastal hazards/ extreme weather is available; climate change is an engineering problem and has engineering solutions
5f	Trust in public action	governmental institutions are working at highest technology standard/ with highest effort to provide disaster prevention and post-recovery aid
5g	Distrust in public action	government isn't doing anything/ not enough (to mitigate; to protect citizens/ the environment)
6	**Experience**	
Impacts from natural disasters in the past on infrastructure/ property/ economy in past, Human loss to natural disasters in past, Impacts from natural hazards on local ecosystems in past		
7	**Power relations/ epistemic communities (sources)**	
Academics (7a); Residents (7b); Business/industry (7c); Unaffiliated research group, unaffiliated expert (7d); Governmental Authorities/ Politicians (7e); Environmental groups (7f); others (celebrities, religious groups, activist) (7g)		

climate change'. These results indicate that while 'Scientific uncertainty and controversy' is often reported (cf. findings on trust), the main message tends to acknowledge anthropogenic climate change and its immediate impacts. However, again the results vary considerably amongst the newspapers. Most importantly, in *The Post and Courier* the topic of climate change had comparably little importance, with very low coverage of any theme on climate knowledge and confidence in climate science in general (cf. Appendix II.3). It is remarkable that none of the articles analysed from *The Post and Courier* had a theme on global warming as an outstanding focus, despite the key words used in searching for articles. These results seem to indicate the particularly influential role of 'Cautious' and 'Disengaged' interpretive communities in *The Post and Courier*.

The theme 'Vulnerability to extreme events and sea level rise' was covered by roughly a third of all articles analysed and was thus very abundant (cf. Figure 2a). Only three articles in total (one in each newspaper) indicated a notion of safety through the theme 'Resilience'. The relative importance of 'Vulnerability to extreme events and sea level rise' in *The Capital* and *The Post and Courier* is most likely linked to the particular exposure to these risks of the communities represented in these papers, as opposed to those represented in *The Herald Sun* (cf. Appendix II.3).

2.2.2 Spaces of contestation in the discursive construction of willingness to adapt

In summary, the analysis has made apparent that discussions of climate change and coastal management in the newspapers analysed are influenced by the contestation of cultural values and practices. It is beyond the scope of this study to identify the influence of specific interpretive communities in these contestations; however, some observations can be made on *spaces of position-takings* (Bourdieu, 1983, p. 312) or *discursive fields* (Sonnett, 2010, p. 700) in which these contestations take place.

Most importantly, norms with regard to desired practices in coastal management are based predominantly on environmental values, often on economic values, and far less frequently on social values. This is important because as statistical norms (as opposed to the absolute norms in visions), these values '[indicate] the [choices] made by the majority' (Hofstede & Hofstede, 2005, p. 21). Hence, the results indicate that the contestation takes place mostly over environmental and economic values. The ranking of norms was the same in all newspapers, so this generalisation seems to be widely applicable. The fact that it is generally shared by the journalists, key sources, and supposedly readers of the respective newspapers of course does not imply that it is shared by the general public. However, this finding could become relevant in practice because several of the main sources are likely to be influential in public decision making.

Secondly, journalistic practices of 'balanced' reporting that are characteristic of American journalism (cf. Brossard et al., 2004) become evident from the balanced distribution of the themes 'Anthropogenic climate change' and 'Doubts about cause of climate change' (cf. Table 5). This journalistic practice demands the 'balanced' reporting of pro- and counter-arguments on any issue. In the context of climate change, it is argued that this creates a bias towards the—effectively very few—deniers of climate change within the scientific community against the overwhelming majority of scientists who believe anthropogenic climate change is happening. This 'balanced bias' might also contribute to the additional perceptions of uncertainty and contestation in the reporting of scientific consensus as well as uncertainty and political dispute on climate change.

Thirdly, the themes found in knowledge construction allow for a distinction of influential interpretive communities in the reporting on climate change and coastal management.

Broadly speaking, the themes found on knowledge illustrate the key arguments by which Maibach et al. (2011) identified the 'Six Americas'—competing interpretive communities on climate change in the US. The distinction between the themes on knowledge allows three of them to be differentiated: The 'Alarmed' perceive climate change as anthropogenic and with immediate impacts; the 'Concerned' perceive climate change as anthropogenic but with distant impacts; and The 'Naysayers' doubt or dismiss the argument that climate change is caused by humans[8]. Moreover, the finding that only a small portion of articles describing local vulnerabilities relate these to climate change indicates the presence of what Maibach et al. (2011, p. 2) describe as the 'Cautious' and the 'Disengaged'—interpretive communities that do not know what to think, or that do not know and therefore do not talk about it. These communities seem to be particularly influential in *The Post and Courier*, considering the low coverage of any theme on climate change (cf. Appendix II.3, Figures 3 and 5). In the context of an increasingly polarised *partisan divide* (McCright & Dunlap, 2011, p. 166) in the construction of knowledge on climate change, the ability to employ scientific data seems to be important.

Fourthly, the results indicate a strong influence of dismissive/doubtful and/or cautious or disengaged interpretive communities in the *ownership* (Oliver-Smith & Hoffman, 2002, p. 11) of coastal risks[9]. All newspapers report abundantly on vulnerabilities to climate hazards and sea level rise (cf. Figure 2a), and amongst those reporting on climate change (i.e., *The Capital* and *The Herald Sun*), the fact that it has direct impacts is the most important message (cf. Appendix II.3, Figure 3). Yet more often than not, the link between the two (i.e., that the immediate impacts from climate change enhance vulnerability to climate hazards and sea level rise) is not made (cf. Figure 2a).

In addition to these general observations, some specific characteristics and differences in the discourse of each newspaper could be identified. They should not be confused with regional differences in culture, but they do illustrate distinct constellations of powerful forces with some influence in the papers' respective areas of outreach.

In *The Capital*, the discussion of climate change and coastal risk is engaged with multiple interest groups representing diverse values, environmental beliefs, and perceptions, ranging from neglect of global warming and defence of the 'American Way' to alarmist calls for fundamental change. Reports are often focused on the context of specific impacts and political action, but also refer to the need for long-term change in behaviour and habits. Discursive power seems to be comparably evenly distributed amongst various interpretive communities. In *The Post and Courier*, values and positions on climate change are equally diverse. However, the domination by certain interpretive communities leads to a more polarised discussion that culminates in neglect and disengagement with the topic.

By contrast, in *The Herald Sun* there is a tendency towards scientific values, but also religious groups have some influence. Arguments centre on an understanding of underlying (scientific) concepts and values, whereas less importance is given to socio-economic consequences and vulnerabilities at the local level. In consequence, it seems climate change

[8] Maibach et al. (2011) distinguish between the 'Doubtful' and the 'Dismissive'; however, the distinction was not clear in the articles analysed.

[9] 'Ownership' of a disaster can be defined as 'the right to claim that it occurred, who its victims were, and the "true account" of events, origin, consequences, and responsibilities' (Oliver-Smith & Hoffman, 2002, p. 11). Accordingly, for this analysis the ownership of risk is to be understood as 'the right to claim the "true account" of events, origin, consequences and responsibilities'.

is discussed more as an abstract concept, world vision, or belief. The importance of political dispute in discussions of climate change underlines the perception that positions on climate change are conceived as a surrogate of political values. This is vividly represented in the ongoing discussion of the amendment of the state's coastal planning policies, which has led to the formulation of a much disputed 'sea level rise calculation bill' (*House Bill 819*, 2012) prohibiting the use of global warming scenarios (Reed, 2012; Campbell, 2012).

The themes identified indicate four topics of relevance in the discussion of adaptation, which can be defined as *spaces of position-takings* (Bourdieu, 1983, p. 312). Spaces of position-takings in discursive fields are the expression of *spaces of available positions* in cultural production (Bourdieu, 1983, p. 312). The spaces of position-takings that the analysis of discourse in newspaper articles identified are the ownership of risk (i.e., the contestation over the 'true account' of events, origin, consequences, and responsibilities in relation to climate variability and change), the politicised discussion of knowledge on climate change and its impacts, the contestation over environmental versus economic values, and the contestation over trust in science and trust in politics.

3 Cultural construction in decision making for coastal adaptation to climate change

3.1 Background

As a consequence of geographical differences in biophysical risks and 'uneven geographical development' (Harvey, 2001, p. 24), environmental hazards are more likely to be transformed into a disaster in some communities than in others (Oliver-Smith & Hoffman, 2002, p. 3). In order to understand how these patterns of vulnerability are formed, understanding the processes that shape them is key (Satterthwaite et al., 2009). The four spaces of position-taking identified in Chapter 2 demonstrate how different framings of climate change and coastal risk are constructed in interpretive communities. The purpose of this chapter is to examine the influence of differences in the framing of climate risk and adaptation needs on intentions to act.

In the study area, coastal change and related uncertainties have increasingly required management responses since the beginning of the 20th century. Important programmes established for this purpose include coastal zone management (made mandatory for coastal states in the Federal Coastal Zone Management Act of 1972) and disaster risk management programmes. While the latter programmes are coordinated at the federal level to a large extent, programme design and institutional arrangement in coastal zone management is the responsibility of individual states. The same is true for strategies for adaptation to climate change within the State and Local Climate and Energy Program (EPA, 2012). This implies that these strategies are responding to (and reinforcing) the locally dominating values, visions, and perceptions, which are explored in this chapter through the lens of institutional behaviour (subchapter 3.2) and public attitudes (subchapter 3.3).

3.2 Institutions' behaviour in coastal adaptation

Along the Atlantic coast, the disproportionate urban growth in coastal areas is associated with 'changes in character' of the coastal population, changing from seasonal populations to year-round residents (e.g., retirees and workers in the tourism industry) and becoming more racially and ethnically diverse (Cutter & Emrich, 2006, p. 103). Shortly after the beginning of amenity migration to the coast, the 'battle for America's beaches' (Dean, 1999) began. Shoreline recession had been under consistent monitoring since the late 19th century, and nevertheless, coastal development continued to increase throughout the 20th century. The first reaction to frequent coastal flooding after storms was the construction of seawalls (Ibid.). However, it was soon observed that 'beaches and seawalls cannot coexist for long' (Ibid., p. 8) because walls trap sand that is then missing for accumulation in the natural process of beach formation, thereby contributing to further shoreline erosion. In order to prevent the loss of the very resource that enticed economic development in coastal areas, the Carolinas reacted by prohibiting the construction of hard structures along the ocean front (Dean, 1999; Kana, 2010). By that time, however, in many areas the damage had already been done. Along the coast, hurricanes have repeatedly opened up inlets, often welcomed by residents and tourists for fishing, navigation, and other uses. As a result, communities quickly adapted to these newly created landscapes, which in effect prohibited natural processes from restoring the equilibrium of the shoreline. Instead, jetties were constructed to maintain inlets,

with serious impacts on beach formation processes and requiring costly measures to maintain beaches in adjacent areas[10].

In spite of the growing exposure of coastal areas to risks, disproportionate urbanisation in these areas continues. This development is encouraged by a number of policies and funding mechanisms at the national level (cf. Cutter & Emrich, 2006; Heinz Center, 2002), as well as by governance structures that contribute to the dominance of economic priorities at the local level (cf. Appendix III). The *Coastal Zone Management Act of 1972 (CZMA)* was implemented in response to the growing challenges requiring coastal states to monitor and manage coastal change (*CZMA*, 16 U.S.C. § 1455). The Act specifically mentions the need for adaptation to accelerated sea level rise due to global warming (*CZMA*, 16 U.S.C. § 1451(l)), and mandates the assessment, mitigation, and compensation of shoreline erosion (*CZMA*, 16 U.S.C. § 1451(10)). The design and institutional arrangement for implementation of state-specific programs is the mandate of the states and varies accordingly in scope and design (cf. Appendix III, boxes 1-3). Climate Action Programs have been developed in all three states. However, Maryland's program is the only one to have developed strategies for adaptation in addition to mitigation (cf. Appendix III, box 3).

Similarities in program design are noticeable amongst the Carolinas, whereas differences arise when comparing their approaches to those applied in Maryland. Namely, while administration in coastal zone management is centralised in the Carolinas, a 'network approach' is applied in Maryland. This implies a more consistent overall strategy for management of the entire coast in the Carolinas, versus various place-specific but less integrated strategies in Maryland (cf. Johnson, 2000, p. 33). To give one example, both programs in the Carolinas envisage a long-term retreat strategy for adaptation to rising sea levels, using setback rules since land ownership at the oceanfront will migrate inland as the coast erodes. In combination with the 'no-hardening rules' applied in both states, this ensures the preservation of beaches and their status as public land. By contrast, in Maryland no such overall strategy exists, and public access to the oceanfront is not granted in the state's regulations (Nuckols et al., 2010; Titus, 1998). At the same time, however, Maryland is the only state of the three where statutory programs recognise accelerated sea level rise from anthropogenic climate change, which several independent initiatives are beginning to address (cf. Johnson, 2000). Meanwhile, a recent attempt to include models of future climate change in the calculation of North Carolina's setback line was rejected by the state Senate[11].

Different designs of the administrative structure of coastal management are further related to differences in priorities in their design. In recognition of the complex interactions of upstream development and coastal systems, coastal management in Maryland is linked to protection of the estuarine system of the Chesapeake Bay in a number of programs[12]. By contrast, in the Carolinas development has been concentrated along the ocean front, as have coastal

[10] Amongst the most dramatic examples are Ocean City on Fenwick Island, Maryland, Oregon Inlet in Outer Banks, North Carolina, and Folly Beach, South Carolina (cf. Dean, 1999).

[11] The findings and methods used in the study carried out by the N.C. Coastal Resources Commission's (NCCRC) Science Panel on Coastal Hazards were questioned by state officials, which led to the enforcement of a law prohibiting the use of climate models in sea level calculation for planning purposes. The bill was passed by the Senate in June 2012 and—after international reactions—rejected by the House of Representatives; however, the agreed compromise requires planning authorities to stick to historical data until a new study is completed in three to four years time (Philipps, 2012).

[12] E.g., the Maryland Coastal Bays National Estuary Program, Chesapeake Bay Program, Chesapeake Bay Critical Area Program—only a few of the many existing programs (cf. Johnson, 2000).

management programs. Priorities in coastal protection changed slightly in the case of North Carolina in response to the devastating impacts from Hurricane Floyd on the low-lying coastal zone further inland (cf. Appendix III, box 2).

Regardless of the different approaches and priorities in program design, considerable similarities can be observed when it comes to implementation, as protection efforts tend to be directed towards resources and sites of economic interest more than following any long-term strategy. This is most obvious in the Carolinas where the setback strategy is undermined by competing (economic) interests. For instance, while landward habitat migration of barrier islands is generally supported on National Park Service land, 'the barrier island [of Cape Hatteras Seashore] itself will not be allowed to disintegrate' as long as officials consider the coastal highway essential infrastructure (Clark et al., 2010, p. 897). In Maryland, the priority of economic interests becomes apparent in strategies applied at the local level. In tourism-oriented ocean fronts around Ocean City, Maryland, efforts have focused on beach replenishment. By contrast, inside Chesapeake Bay coasts tend to be armoured to protect coastal development (Titus, 1998, p. 1282). Neither of these strategies is sustainable in the long run as replenishment is already becoming increasingly costly and armoured coasts prevent the natural migration of valuable coastal habitats (e.g., tidal wetlands), as well as lead to the loss of publicly accessible land (Titus, 1998, p. 1281). The resulting patterns of hindered adaptation have been mapped to show 'the likelihood of shore protection' in communities along the Atlantic coast in a report to the EPA (Titus & Hudgens, 2010), published as 'sea level rise planning maps' by the authors (cf. Appendix IV.2).

3.3 Public behaviour in coastal adaptation

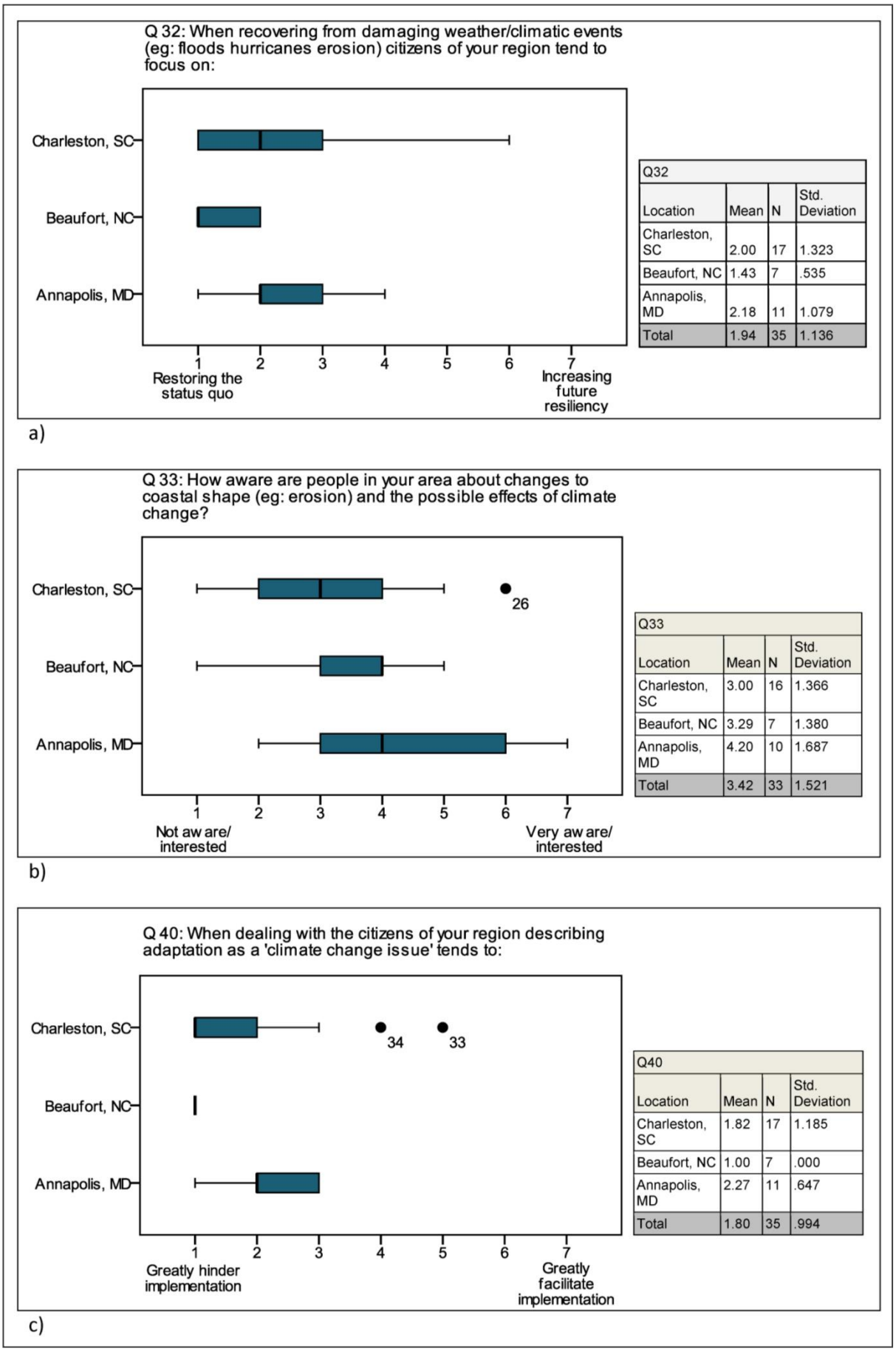
The reported implementation gaps show that state-wide strategies are not always supported by local decision makers. Moreover, conflicts of interests become evident when looking at public reactions and attitudes to coastal change. In a survey conducted by Ecologic Institute amongst officials involved in decision making for coastal management in the three states, data were collected on public attitudes towards coastal management and adaptation to climate change, including the particular role of culture in coastal residents' behaviour. As part of an ongoing research project comparing adaptive behaviour in coastal regions of the Baltic States and the USA (cf. Martinez, 2012), the main purpose of the survey was to identify culturally shaped behaviour and attitudes on adaptation to climate change in the region as a whole. At the same time, the data collected in three separate workshops held in Annapolis (Maryland), Beaufort (North Carolina), and Charleston (South Carolina) draws a picture of regional differences in public behaviour and attitudes towards coastal change and adaptation to climate change as perceived by those responsible for implementing adaptive action. Rather than showing the reality of attitudes and behaviour amongst coastal residents, the results discussed below reveal experiences and perceptions decision makers have of residents' behaviour and willingness to adapt. The implications of this construction for implementing adaptation strategies are discussed in section 3.4.

Decision makers in all states reported a tendency amongst coastal residents to 'restore the status quo' rather than 'increasing future resiliency' when recovering from natural disasters (cf. Figure 2a). The combination of this result with those showing very low to very high awareness of change as expressed in Q. 33 (Figure 3b) suggests that only some do not prepare for uncertain future changes out of ignorance. As most participants stated in Q. 33, many residents seem to be aware of change at least to some degree; hence, when they are restoring the status quo, they seem to be conscious of the risk involved. This suggests that many residents tolerate coastal change and associated risks, which they do not perceive as

increasing to an extent that would affect their current way of life. The results from Maryland stand out with higher awareness of coastal and climate change reported and a slightly higher tendency to increase future resilience. As the question combines awareness of coastal transformation and awareness of climate change, the results can be interpreted twofold: With regard to awareness of the possible effects of climate change, the results are consistent with the slightly greater acceptance of strategies for adaptation to climate change in Maryland (cf. Figure 3c) and the state's implementation of adaptation activities. By contrast, the results are striking when looking at them in the context of awareness of changes to the coastal shape, as extreme efforts have been made in order to adapt in all three states, particularly the Carolinas. Several participants stated a high degree of willingness to take private action, particularly in Maryland (cf. Figure 4a), indicating that some residents perceive their own coping capacity as high.

The unanimity with which a tendency to restore the status quo was stated by participants in North Carolina is cause for concern considering the retreat strategy implemented in the state after Hurricane Floyd. Similarly alarming is the result of Q. 28 (Figure 4a), according to which 'passive acceptance' of the fact that land loss and inundation is and will continue to occur is very low in North Carolina. These results indicate experiences or decision makers' perception of local resistance to implementation of the retreat strategy in North Carolina. In Maryland, where farmers have had to abandon land and homes after coastal inundation along the Eastern shore of the Chesapeake Bay, acceptance of land loss and inundation was reported to be slightly higher[13]. A tendency to resist coastal change rather than adapt to it was identified also from the results of Q. 29 (Figure 4c), in contrast to the acceptance rather than opposition to anthropogenic shoreline changes which was also stated. Acceptance was assessed highest in South Carolina, which is not surprising considering the particularly accelerated rate of urbanisation along the state's coast.

[13] The poll retrieved no data from the workshop in Charleston.



Q32

Location	Mean	N	Std. Deviation
Charleston, SC	2.00	17	1.323
Beaufort, NC	1.43	7	.535
Annapolis, MD	2.18	11	1.079
Total	1.94	35	1.136

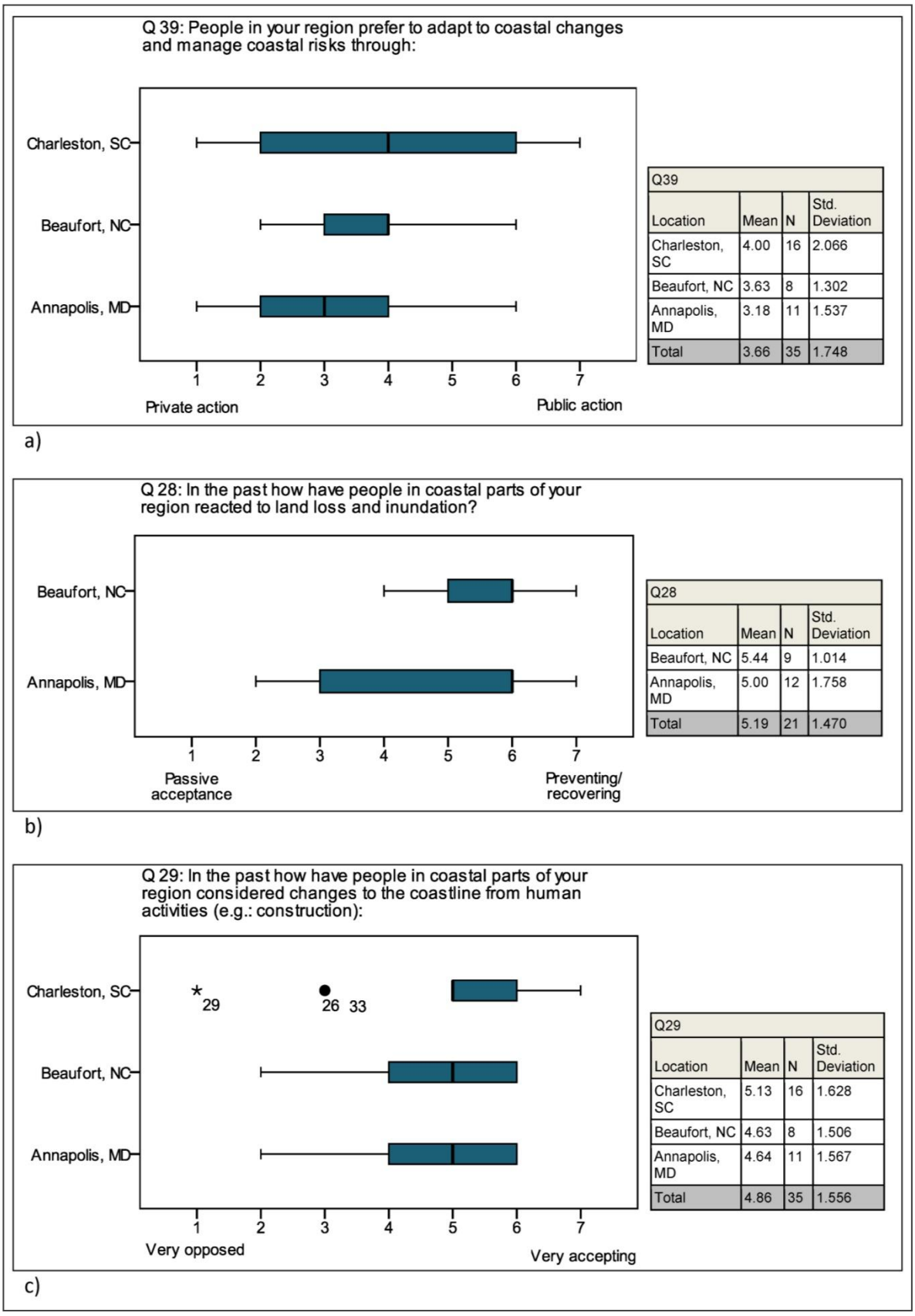
Q33

Location	Mean	N	Std. Deviation
Charleston, SC	3.00	16	1.366
Beaufort, NC	3.29	7	1.380
Annapolis, MD	4.20	10	1.687
Total	3.42	33	1.521

Q40

Location	Mean	N	Std. Deviation
Charleston, SC	1.82	17	1.185
Beaufort, NC	1.00	7	.000
Annapolis, MD	2.27	11	.647
Total	1.80	35	.994

Figure 3 Responses to survey questions on citizens' perceptions of climate risks (Q. 32, 33, 40) by location of data collection. Source: own design, based on data from Ecologic Institute (2012)



Q39

Location	Mean	N	Std. Deviation
Charleston, SC	4.00	16	2.066
Beaufort, NC	3.63	8	1.302
Annapolis, MD	3.18	11	1.537
Total	3.66	35	1.748

Q28

Location	Mean	N	Std. Deviation
Beaufort, NC	5.44	9	1.014
Annapolis, MD	5.00	12	1.758
Total	5.19	21	1.470

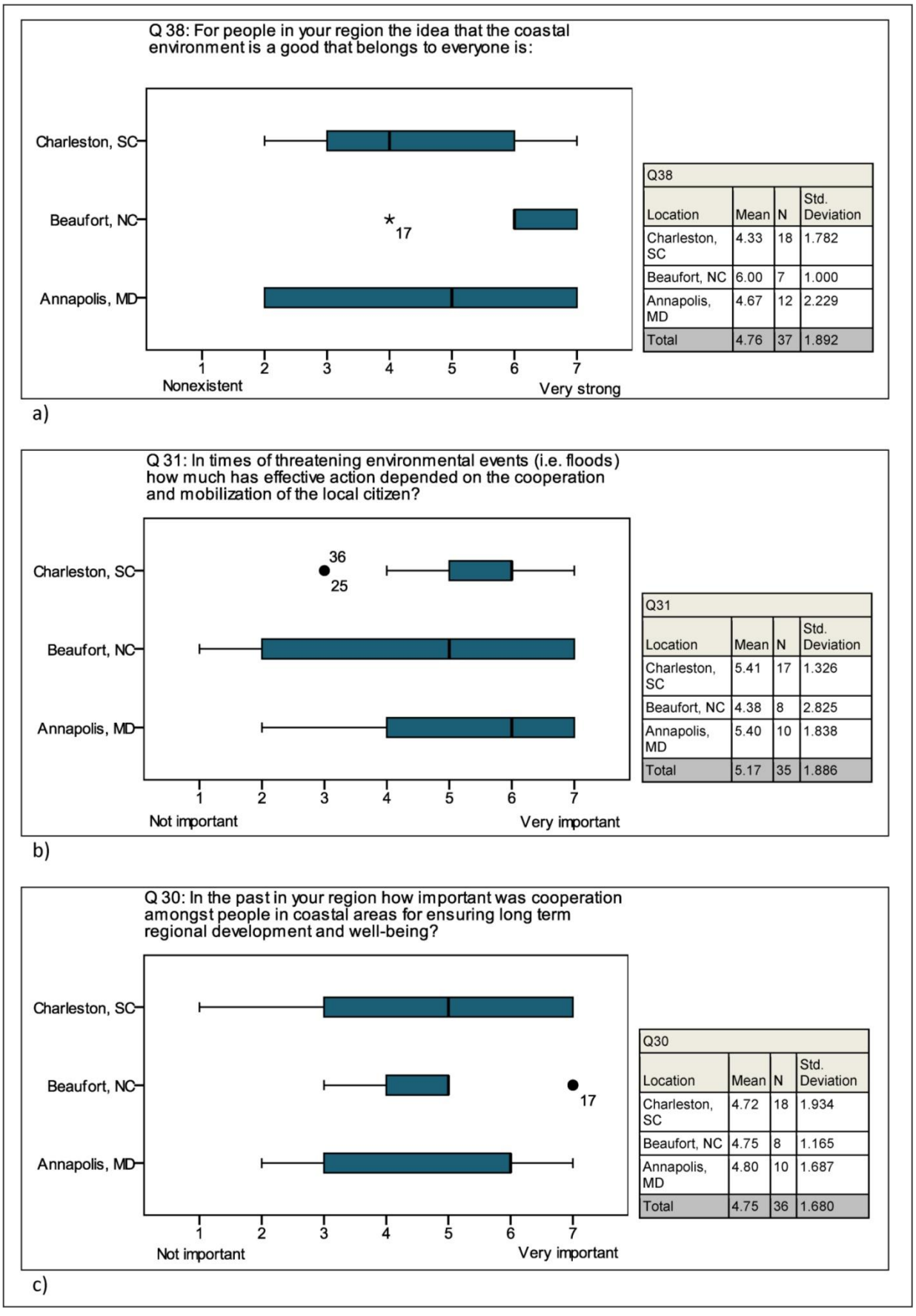
Q29

Location	Mean	N	Std. Deviation
Charleston, SC	5.13	16	1.628
Beaufort, NC	4.63	8	1.506
Annapolis, MD	4.64	11	1.567
Total	4.86	35	1.556

Figure 4 Responses to survey questions on citizens' reactions to coastal change (Q. 39, 28, 29) by location of data collection. Source: own design, based on data from Ecologic Institute (2012)

Decision makers in Maryland and South Carolina both reported a range from ‘almost non-existent’ to ‘very strong’ valorisation of coastal resources as a public good (cf. Q. 38, Figure 5a). The fact that the value of coastal resources as a public good is perceived to be slightly higher in Maryland than in South Carolina is remarkable because while Maryland’s legislation does not warrant public access to beaches, guaranteed public access to the oceanfront is at the core of the Beachfront Management Program in South Carolina. By contrast, in North Carolina there was near consensus that the idea of coastal resources as a public good is very strong amongst residents. The reported diversity of perceptions on ownership of coastal resources will become crucial in the discussion of future retreat strategies since publically owned tidal lands will be lost if not allowed to migrate inland (cf. Titus, 1998, on foreseeable conflicts over land ownership in adaptation to sea level rise in Maryland).

The cooperation and mobilisation of local citizens was considered by some to be crucial in coping with natural hazards (cf. Q. 31, Figure 5b) and for ensuring long-term regional development and well-being (cf. Q. 30, Figure 5c); however, responses to both questions covered the full range from ‘not important’ to ‘very important’. These results indicate that some decision makers believe engaging local citizens enhances efficiency in implementing action, while for others this is not important. The range of perception was greatest in North Carolina—again, this is alarming when recalling the consequences of low adaptive capacities of local communities in NC in the aftermath of Hurricane Floyd (cf. Heinz Center, 2002, pp. 54-55).



Q38

Location	Mean	N	Std. Deviation
Charleston, SC	4.33	18	1.782
Beaufort, NC	6.00	7	1.000
Annapolis, MD	4.67	12	2.229
Total	4.76	37	1.892

Q31

Location	Mean	N	Std. Deviation
Charleston, SC	5.41	17	1.326
Beaufort, NC	4.38	8	2.825
Annapolis, MD	5.40	10	1.838
Total	5.17	35	1.886

Q30

Location	Mean	N	Std. Deviation
Charleston, SC	4.72	18	1.934
Beaufort, NC	4.75	8	1.165
Annapolis, MD	4.80	10	1.687
Total	4.75	36	1.680

Figure 5 Responses to survey questions on cooperation amongst coastal citizens (Q. 38, 31, 30) by location of data collection. Source: own design, based on data from Ecologic Institute (2012)

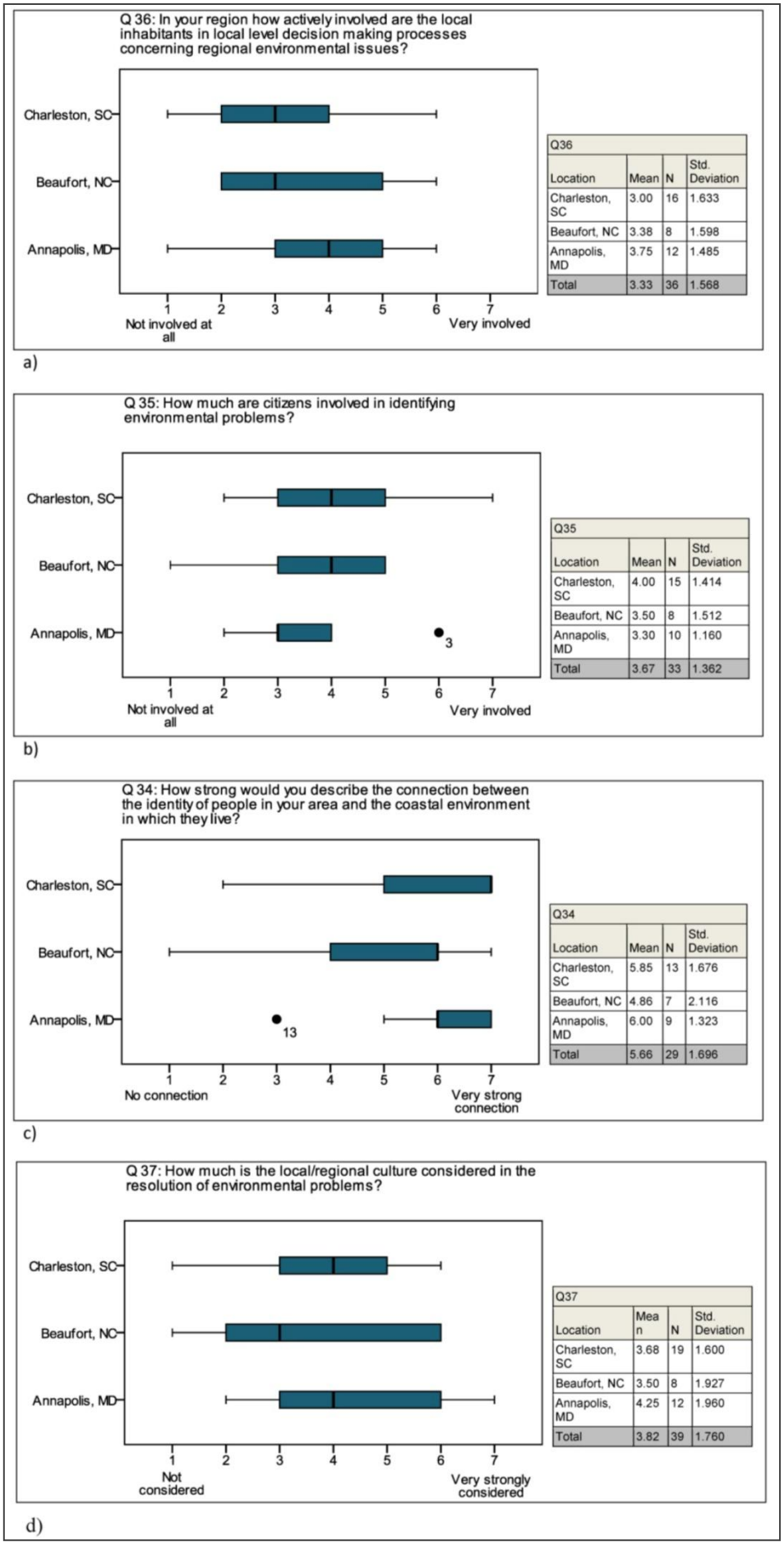


Figure 6 Responses to survey questions on participation in decision making (Q. 36, 35, 34, 37) by location of data collection. Source: own design, based on data from Ecologic Institute (2012)

A broad range of perceptions were reported also on the engagement of residents in decision-making processes concerning regional environmental issues (cf. Q. 36, Figure 6a) and in identifying environmental problems (cf. Q. 35, Figure 6b). High levels of participation were reported slightly more often in decision making but less often in identification of environmental problems in Maryland compared to the other two samples. The differences are very small, however, when taking into account that the institutional design of coastal management is much less centralised in Maryland. The vast majority of participants stated that describing adaptation as a climate change issue would greatly hinder implementation (cf. Q. 40, Figure 3c). This notion was most explicitly stated in North Carolina.

The majority of participants in all workshops stated that there was a strong (North Carolina) or very strong (Maryland and South Carolina) connection between the identity of people in the area and the coastal environment in which they live (cf. Q. 34, Figure 6c). Yet perceptions on the extent to which local or regional culture is considered in the resolution of environmental problems were highly diverse in all workshops (cf. Q. 37, Figure 6d) and no trend can be observed from the responses. In other words, while some decision makers consider culture important, and some involve citizens, neither considering culture nor involving citizens is the norm in decision making, and top-down approaches seem to be quite common.

In summary, the picture decision makers draw of attitudes amongst coastal residents is that of a close connection to their environs and awareness of the particular vulnerabilities that are part of living at the coast. At the same time, the attachment of residents to the coast seems to be concordant with ongoing coastal development. The results suggest that coastal residents perceive some degree of coastal variability and change as natural and are willing to cope with associated risks in order to enjoy the benefits of living at the coast. By contrast, implementing strategies that involve long-term change in behaviour or living conditions seem to be far less acceptable for most residents. This perception of local resistance to long-term strategies held by those responsible for implementing change suggests struggles in the contestation over opposed positions on climate change and adaptation. These are explored in the following subsection within the spaces identified in chapter 2.2.2.

3.4 Spaces of contestation in decision making for adaptation

The results from the survey demonstrate how contestations in the spaces identified in the cultural construction of environmental beliefs, risk perceptions, and climate knowledge are reflected also in practice. The contestation over values is chiefly reflected in the aftermaths of coastal disasters when communities in areas of low density have been relocated, whereas in oceanfront amenity destinations, houses have been elevated (cf. Hurricanes Floyd in North Carolina and Isabel in Maryland). Moreover, it becomes evident from state and city officials' support for beach replenishment in coastal areas of high property value, in addition to the loosening of the 'no-hardening' rule in the Carolinas, which contradicts the states' retreat strategies in adaptation to sea level rise. Along the densely populated Western Chesapeake Bay shore, by contrast, beaches are not replenished but the coast is armoured—'officials tend not to think of the bay shore as a community asset' (Titus, 1998, p. 1301). In South Carolina, the domination of economic and environmental norms is institutionalised in the dichotomous strong focus on protection of profitable coastal resources in the Beachfront Management Plan and a conservationist approach in the Coastal and Estuary Land Conservation Program that excludes development and ignores sea level rise. In short, the selection of adaptation strategies is often based on local interests in areas where economic stakes are high and based on regional/state interests where (local) economic stakes are low

and (regional) environmental stakes high. Regardless of any differences in management approaches, this pattern[14] can be observed throughout the study area, and no cultural differences become apparent. Poor participation in decision making is likely to have contributed to this universal pattern of neglecting local residents' values.

Contestations in the construction of knowledge are most vividly represented in the design of strategies for adaptation to sea level rise in the Carolinas, which is heavily influenced by interpretive communities of 'naysayers' and 'disengaged'. In North Carolina, the latter is evident in the contestation over models to be used in estimation of future sea level rise.[15] In South Carolina, it is demonstrated in the absence of strategies for adaptation to sea level rise in the state's coastal management programs. In both states, the EPA's recommendation to consider the impacts from climate change in planning is ignored. While 'alarmists' have a greater influence in decision making in Maryland, knowledge construction amongst residents is influenced as much by less convinced interpretive communities as in the other states, and mentioning 'climate change' equally hinders implementation of adaptation activities. Results from the survey suggest that further positions on knowledge about coastal risk and climate change exist at the local level (cf. Q. 34) but currently do not to enter the decision making process in which local residents rarely participate.

The results show moreover that risk ownership is contested in regional planning, local decision making, and—presumably—amongst local residents. What the analysis demonstrates is that respective risk perceptions differ not only in spatial scale but also in timeframes. While awareness of long-term impacts from coastal and climate change is high in regional planning, local decision makers are often reluctant to accept the need to adapt to long-term change. Instead, they tend to implement medium-term strategies for prevention (i.e., the elevation of land) or rely on post-disaster recovery (i.e., beach replenishment). This approach is becoming increasingly costly, but as long as property values are increasing, these costs are widely tolerated[16]. The real estate market therefore has a strong influence in constructing risk, particularly in amenity destination communities in the Carolinas. As a consequence, risk is carefully constructed as impacts from coastal hazards are concealed in enormous beach replenishment efforts, creating a notion of stability and protection in order to attract property buyers (cf. Finewood, 2012). The resulting conflicts between regional and local planning have been described above. They are further enhanced by dominating risk perceptions amongst residents which, similar to those in local decision making, acknowledge the impacts from coastal hazards but construct them as foreseeable and controllable.

Finally, contestations over trust and uncertainty have been shown to shape the relationship between actors at different levels of scale. Although acknowledging the strong connection of coastal residents to their environment, most decision makers do not include them meaningfully in assessment of change and decision making. Moreover, decision makers disagree on whether culture is important in coastal planning, and tend to apply top-down planning approaches in which local initiatives have little importance. The implications are substantial as the experiences after Hurricane Floyd demonstrate. Recovery aid in mostly African American communities in Eastern North Carolina failed to recognise local needs and capacities in place, and as a consequence showed little effect. An attitude of distrust

[14] cf. Appendix IV.

[15] The study recommended planning for a mean rise of one meter by 2100 (NCCRC, 2010), which would require a setback strategy for an area of approximately 5835.9 km² (cf. Titus & Richman (2001, p. 219)).

[16] Cf. Appendix III.

amongst community members towards federal and state agencies was not only the reason but also is very likely to be the consequence of this incident (cf. Heinz Center, 2002). Trust in scientific data is moreover highly contested amongst lobbyists, politicians, and scientists in the context of assessing future sea level rise in North Carolina.

4 Conclusion

The results demonstrate that cultural differences in perception of the need to adapt to climate change are constructed through contestations over divergent positions. Conceptualising these in spaces of contestation has helped to identify critical issues that are most vividly debated and, as such, both manifest and reinforce values and practices in the respective epistemic communities. Such critical issues are the contestation over values, knowledge, trust, and ownership of risk. They provide a useful framework for analysis of implications of differences in cultural construction of adaptation needs for coastal management and adaptation in practice, as examined in the second part of the analysis.

Based on the data analysed, a pattern of strategies for adaptation to sea level rise and coastal hazards, implemented based on locally dominating values, risk perceptions, and knowledge, has been identified. Across the region, the crucial role of values in creating this pattern has been demonstrated. Local values often contrast with the states' visions for coastal management, particularly when economic interests are strong; and similarly practices contrast with discourse. While environmental values ranked higher than economic in journalistic spaces of contestation, in practice economic values seem to dominate. In other words, values that have been expressed as the *desired* in discursive fields seem to be more representative of the *desirable* when it comes to practice. The consequences are particularly alarming in South Carolina, where tourism is the most important economic sector and is concentrated at the coast.

Associated with the domination of economic values is the political interest in knowledge construction and ownership of risk, driven by the dependence of community development on property taxes. Particularly in tourism-based North and South Carolina, the urgency to act in adaptation to climate change is largely neglected in spite of alarming projections by scientists. The denial of accelerated coastal change as a consequence of climate change is somewhat contradictory to generally high perceptions of risk from coastal hazards, including rising sea levels. It reflects a *culture of uncertainty avoidance* (Hofstede & Hofstede, 2005). Where coastal change is perceived as predictable from historic trends, it is perceived as manageable and corresponding strategies are implemented (such as the setback strategies in the Carolinas). Consequently, there seems to be a perception of high capacity to adapt to climate variability, which is challenged by the uncertainties in projections that take into account climate change. Rather than embracing these challenges, local decision makers and private households tend to stick to their visions of manageable change, and—whether consciously or not—take the great risk of deferring action until more data are available. In Maryland, where the challenges of uncertainty have been embraced in the implementation of pilot projects within the Climate Smart Communities program, attitudes amongst the general public follow the same patterns as in the Carolinas. Hence, across the study area currently dominating values and practices hinder the implementation of strategies in adaptation to climate change. While supportive attitudes are also present, they often do not enter the decision-making process under its current design.

5 Recommendations for further research

This study has identified the role of culture in the construction of willingness to adapt to climate change at a regional level, based on differences in dominating values and practices. In order to better understand the cultural construction of willingness to adapt to climate change, further research is required on contestations at the local level. The spaces of contestation identified in this study can provide a useful framework for such assessments. Enhancing knowledge in this area is critical, as the analysis has demonstrated that planners and decision makers are well aware of residents' role in implementing adaptation strategies yet most do not engage with them in their professional practice. The research currently undertaken at Ecologic Institute and Duke University is an important step in identifying the crucial role of culturally constructed capacities and constraints in the implementation of strategies for adaptation to climate change and thus for developing more effective planning mechanisms.

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7 Appendices

I. Limitations in knowledge production and communication on adaptation to climate change

Three main causes for shortcomings in the production of applicable knowledge for climate adaptation have been identified by Parson et al. (2003) in the context of the US. To begin with, the standard framework for analyzing impacts, vulnerability, and adaptive capacity (as used by the IPCC (2007, p. 5)) requires a clear distinction between sensitivity and adaptation—which, while useful as a concept, is difficult to distinguish in practice, mostly because adaptive capacity varies over time (cf. Parson et al., 2003, p. 11; Smit & Pilifosova, 2001). As a consequence, 'studies that ignore or assume no adaptation are likely to overestimate vulnerabilities, whereas those that assume full adaptation are likely to underestimate impacts and vulnerabilities' (Smit & Pilifosova, 2001, p. 884). Secondly, cross-scale interactions between sectors and ecosystems are often overlooked, which possibly leads to contradicting recommendations in different sectors/areas (cf. Adger et al., 2005). And lastly, climate impacts are linked to multiple stressors, including both environmental and non-environmental change, and their complex interactions present a considerable difficulty in developing adequate scenarios for future impacts. As a consequence of the above, climatic responses of ecosystems and socio-economic systems remain poorly understood (Parson et al., 2003, p. 12).

Next to limitations in knowledge production, the means and messages used to circulate knowledge on climate impacts and options for adaptation have limited capacity in raising problem awareness and triggering action. The wider public—and policy makers in particular—rely to a large extent on mass media to acquire scientific knowledge and construct their understanding of risk (cf. Blaikie et al., 1994; Boykoff & Boykoff, 2007, pp. 1191-1192; Brulle et al., 2011; Dilling & Moser, 2007; Tribbia & Moser, 2008). However, news about climate change is particularly prone to being submerged in the 'issue attention cycle' (Boykoff & Boykoff, 2007, p. 1195; Downs, 1972; McComas & Shanahan, 1999). The construction of news about climate change through narratives is therefore an important tool to raise and maintain interest in the issue (McComas & Shanahan, 1999). However, journalistic values and norms entail obstacles in creating narratives that support problem awareness about climate change, particularly in the context of US news media (cf. Boykoff & Boykoff, 2007; Brossard et al., 2004). Most importantly, 'balanced' reporting of pro- and contra-arguments creates a bias towards the naysayers, who in the US context are often influential politicians and as such regarded as trustworthy authorities (cf. Brulle et al., 2011). Furthermore, journalistic norms lead to either non-reporting or narratives that ignore underlying causes and long-term consequences (Boykoff & Boykoff, 2007).

II. Newspaper analysis

II.1. Newspapers and their areas of outreach

The Capital is the major daily newspaper serving Annapolis, Maryland. It is published as an evening paper from Monday to Saturday with a circulation number of 33,819 and has an additional Sunday edition with a circulation number of 38,373 (ABC, 2012). It is published by the local publisher Capital Gazette Communications Inc (Nexis UK (a)). The paper is the 2nd largest daily newspaper in Maryland[17].

The Herald Sun is a daily newspaper published by The Durham Herald Company and serves the 'Research Triangle', a region of seven states influenced by the presence of Duke University, North Carolina State University and University of North Carolina (Nexis UK (b)). The newspaper has circulation numbers of 21,367 from Monday to Saturday and 22,268 for its Sunday edition (ABC, 2012).

The Post and Courier (Charleston) is South Carolina's oldest newspaper and the 3rd largest in the state (The Post and Courier, 2012). It is published daily by Evening Post Publishing Co. with circulation numbers of 87,817 during week, 79,886 for Saturday, and 95,291 for its Sunday edition (ABC, 2012).

The Capital, published in Maryland's capital Annapolis at the shore of Chesapeake Bay, is likely to speak for communities that have a long history of experiences with environmental hazards, both from coastal storms and sea level rise and from upstream pollution, which has long been a problem in the Bay. Moreover, the area of outreach of the newspaper is likely to include individuals and institutions involved in decision making at state level due to the presence of state government bodies in Annapolis[18]. Durham, the place of publication of *The Herald Sun*, is inland in North Carolina, approximately 300 km from the coast. Hence, communities represented in this newspaper are less likely to have direct experience with coastal vulnerability and change. Instead, a group of intellectuals is likely to be an influence because the area of outreach includes the 'Research Triangle', an area where research institutions, companies, and governmental agencies of supra-regional influence are based, including three universities and the Environmental Protection Agency (EPA)[19]. Finally, communities influencing and influenced by discourse in *The Post and Courier* are likely those that have had immediate experiences with coastal hazards and vulnerabilities, and have strong stakes in protecting coastal resources for amenity uses, as the paper's area of dissemination in and around Charleston has been developing rapidly from coastal tourism.

[17] The largest paper, *The Sun*, published in Baltimore, was not accessible through Nexis UK for the time period searched and therefore could not be included.

[18] An example is the Department of Natural Resources (DNR), which leads the state's Coastal Zone Management Program.

[19] One indication for the importance of these institutions to the newspaper's readers is the seperate sports section for Duke University, University of North Carolina, and North Carolina Central University.

II.2. Themes in narratives on climate change

The method of coding themes was developed by McComas & Shanahan (1999) in an analysis of narratives on global climate change over time. Themes identified in the study are listed in Table 1. The method was applied by Brossard et al. (2004) in a comparison of coverage on global climate change in the French and American media. Sources were also identified by Brossard et al. (cf. Table 2). In both studies, themes were quantified in coding narratives as absent, present, or outstanding in order to track the importance of different narratives (or *themes*) (cf. McComas & Shanahan, 1999, p. 41). In both studies, articles were selected by key words, and themes were identified in repeated pilot testing of the code sheet.

Themes in Narratives on Global Climate Change
New evidence or research
General science background
Controversy among scientists
Consequences of warming
Economics/costs of remedy
Domestic politics
International relations
Current weather
Change in temperatures
Time range for temperature change

Box 1 Themes identified by McComas & Shanahan (1999, p. 41)

New evidence or research presented	Announcement of a new government study, a new scientific report, or a new environmental group report
Scientific background	General scientific and/or technological background of an issue (e.g., description of previous research, recapitulation of 'known' results and findings)
Consequences	Consequences of global warming—bad or good (e.g., environmental, social, health), worst- or best-case scenarios, predictions and projections
Economics	Costs of remedy or solutions to counter global warming effects
Domestic politics	Debate over environmental policy, laws, regulations, political speeches, campaigns, etc. (This theme was recorded when politics was the focus, not the forum.)
International relations	Summits, treaties, disputes, UN-sponsored research
Current weather	Abnormal patterns, severe storms, drought
Sources	(a) academic/university professor, researcher, or scientist; (b) resident/citizen 'on the street' (i.e., nonexpert interview); (c) business/industry group; (d) economists; (e) unnamed experts or officials; (f) unaffiliated or independent research group; (g)

governmental sources; and (h) environmental groups

Box 2: Themes identified by Brossard et al. (2004, p. 368)

II.3. Themes identified in analysis of newspaper articles

In this study, key words used for the selection of articles were 'climate change', 'global warming', 'sea level rise', 'climate AND risk', and 'coast AND management', returning 248 articles out of which 120 were analysed, as described in Chapter 1. In the following step, the entire sample of 120 articles on climate change and coastal management was analysed by quantifying the frequency with which themes appeared in each newspaper. Themes were coded in the following manner, based on the key arguments found in a first screening of the articles.

Values

'Environmental values' implies any reference to the appreciation of ecosystems and species, as well as a concern for their protection from human practices/ impacts. Discussions of financial costs and benefits from adaptation and environmental risks were coded as 'economic values', and articles coded for 'social values' discussed social costs and benefits from adaptation strategies, e.g., in the context of employment opportunities. The same procedure led to the identification and enumeration of the remaining themes.

Visions

One theme that could be identified as a desirable norm was a vision of 'Sustainability'. Respective arguments share the perception that the current way of life is not sustainable, expressed in particular in a critique of current levels of energy consumption, energy production, as well as current ambitions in coastal management to secure an artificial shoreline. As a complementary theme in visions of sustainability, a vision of the 'American Way' was identified, expressing a vision of the current way as a right of the Americans.

Sources as indicators of power relations

Sources cited in the media indicate power relations because they are a) considered a trustworthy source for factual data or as representative of a group of stakeholders by the author/the newspaper's editor (Keller, 2005), and b) holders of discursive power influence the understanding and opinion amongst a wider public (cf. Castree, 2001, p. 12; Sonnett, 2010). Sources identified were: Academics; Residents; Business/Industry; Unaffiliated Research Group, Unaffiliated Expert; Governmental Authorities/Politicians; Environmental Groups;Others (celebrities, religious groups, activists). There are of course big overlaps in these categories, for instance residents are highly likely also to belong to at least one of the other categories through their job.

Knowledge

Dominating themes identified with respect to climate knowledge refer to the perception of the cause of climate change[20], distinguishing between acknowledgements of man-made climate change versus any type of scepticism towards this perception. Moreover, a distinction was found between the description of impacts from climate change as distant in time and space and their portrayal as impacts with immediate consequences for the local context.

Trust

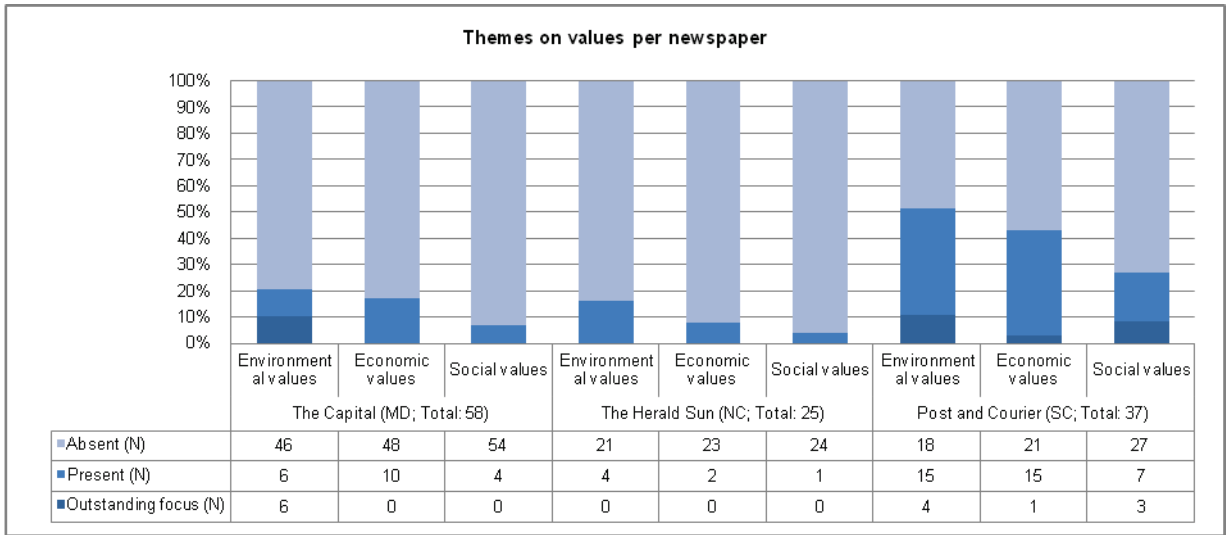
While exploring the data on perceived knowledge about climate change in the three states, it is worthy to look at the way it is framed (cf. Nisbet, 2009)—as a fact on which scientific unanimity exists, as a controversial scientific hypothesis, or as a topic of political dispute. From the themes identified, the framing of knowledge can best be described with themes found on trust. These include 'scientific uncertainty', referring to the reporting of unorthodox practices in climate research (such as those represented in the *Climategate* scandal), as opposed to 'scientific consensus', stating scientific unanimity on the causes of climate change. The use of 'scientific data' to support a position was identified as a further indicator of trust in science (on climate change). The theme 'political dispute' was derived from an abundant reporting of climate change as a topic in political campaigns, e.g., in the context of the forthcoming presidential elections as well as discussions amongst state and local politicians. Next to these themes with specific relevance for the construction of knowledge on climate change, themes found on *trust* include the presentation of technological solutions for coastal hazards and impacts from climate change ('trust in technology'). Also, the discussion of public action had two opposed *trust* themes, indicating 'trust in public action', where current actions are described with confidence in their success, versus 'distrust in public action', where governmental institutions are criticised for providing inadequate or insufficient protection from current and/or future coastal risks.

Risk perceptions

Risk perceptions are often the result of 'very contested forms of discourse' on the occurrence, causes, and consequences of environmental disasters (Oliver-Smith & Hoffman, 2002, p. 11). They entail a diversity of cultural conceptions, such as uncertainty, peril, safety, fortune, and fate, all of which are core elements of worldviews (Ibid.). For the purpose of this analysis, risk perceptions are analysed through the portrayal of vulnerability and resilience (cf. Chapter 1). Two themes were identified expressing perceptions of vulnerabilities in coastal areas. 'Vulnerability to extreme events and sea level rise' describes impacts from these hazards in terms of human loss, economic loss, and damages to the physical environment, as well as in many cases the inefficiency of current (governmental) programs for disaster risk management and coastal protection. In the theme 'Vulnerability to climate change', these impacts are described explicitly in the context of climate change (i.e., referring to the increase in risks from extreme events and sea level rise as a result of climate change).

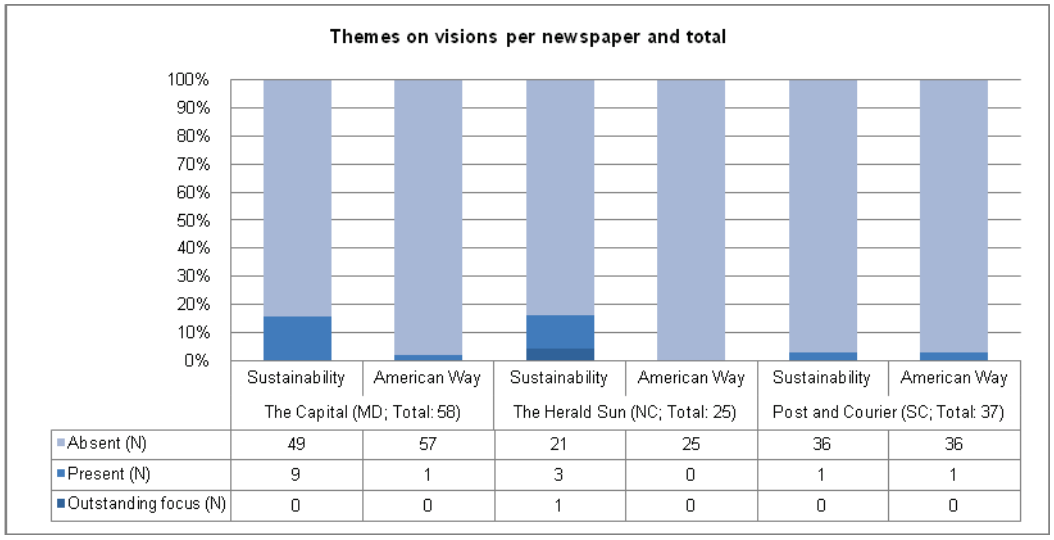
[20] Although it is scientifically imprecise, climate change and global warming are used interchangeably in this text, assuming that the common use of 'global warming' in the newspapers analysed refers to what scientists describe as anthropogenic climate change.

II.4. Frequencies of themes in local media by newspaper



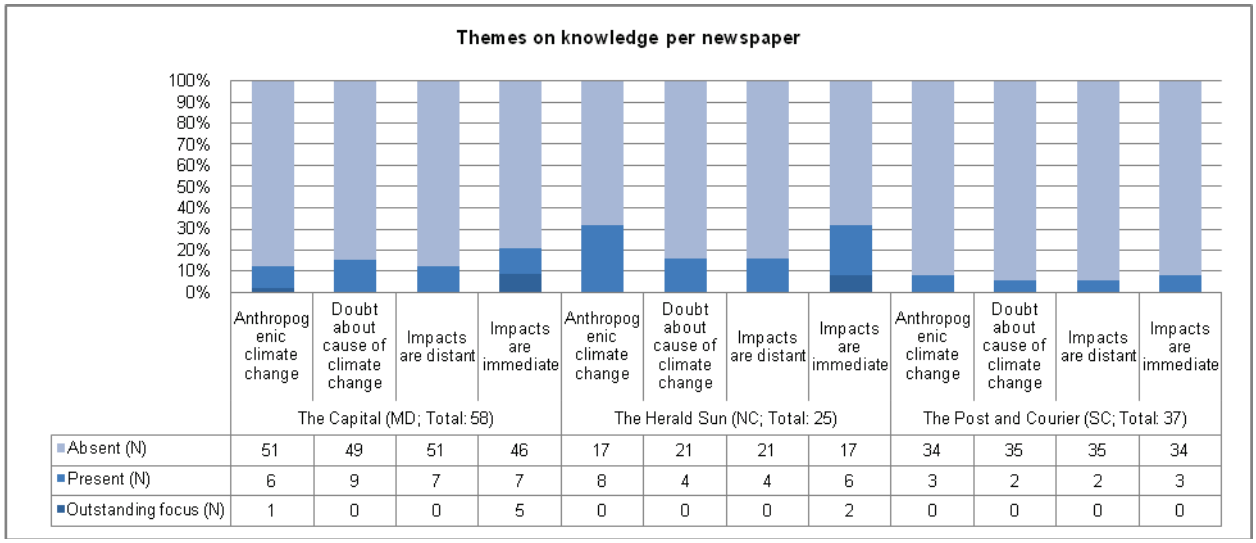
	Environmental values	Economic values	Social values	Environmental values	Economic values	Social values	Environmental values	Economic values	Social values
	The Capital (MD; Total: 58)			The Herald Sun (NC; Total: 25)			Post and Courier (SC; Total: 37)		
Absent (N)	46	48	54	21	23	24	18	21	27
Present (N)	6	10	4	4	2	1	15	15	7
Outstanding focus (N)	6	0	0	0	0	0	4	1	3

7) Absolute and relative frequencies of themes on values per newspaper



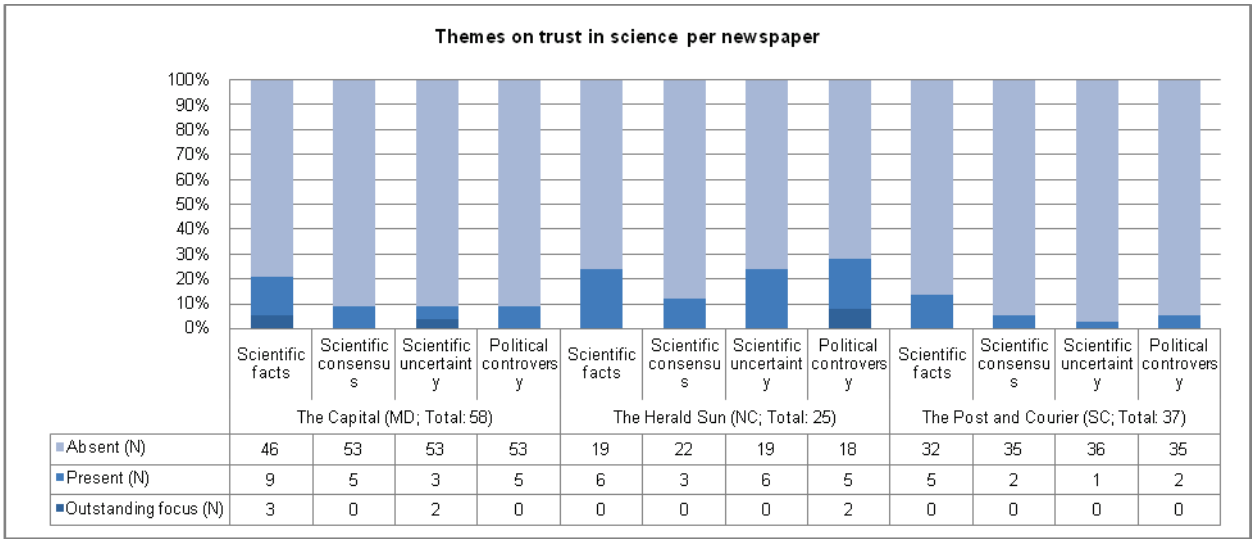
	Sustainability	American Way	Sustainability	American Way	Sustainability	American Way
	The Capital (MD; Total: 58)		The Herald Sun (NC; Total: 25)		Post and Courier (SC; Total: 37)	
Absent (N)	49	57	21	25	36	36
Present (N)	9	1	3	0	1	1
Outstanding focus (N)	0	0	1	0	0	0

8) Absolute and relative frequencies of themes on visions per newspaper



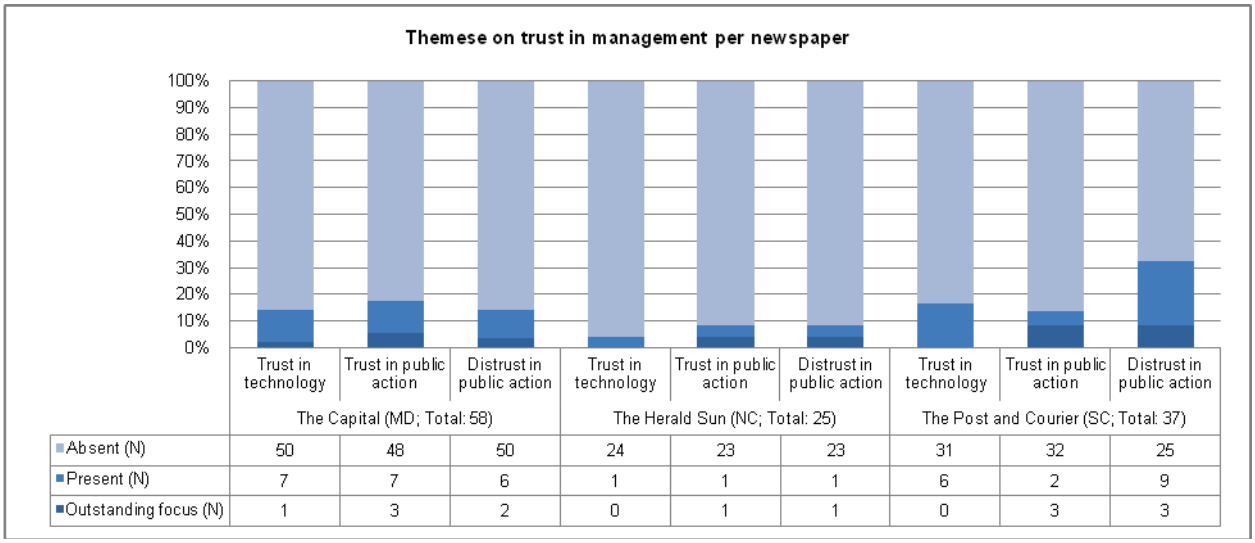
	Anthropogenic climate change	Doubt about cause of climate change	Impacts are distant	Impacts are immediate	Anthropogenic climate change	Doubt about cause of climate change	Impacts are distant	Impacts are immediate	Anthropogenic climate change	Doubt about cause of climate change	Impacts are distant	Impacts are immediate
	The Capital (MD; Total: 58)				The Herald Sun (NC; Total: 25)				The Post and Courier (SC; Total: 37)			
Absent (N)	51	49	51	46	17	21	21	17	34	35	35	34
Present (N)	6	9	7	7	8	4	4	6	3	2	2	3
Outstanding focus (N)	1	0	0	5	0	0	0	2	0	0	0	0

9) Absolute and relative frequencies of themes on knowledge per newspaper



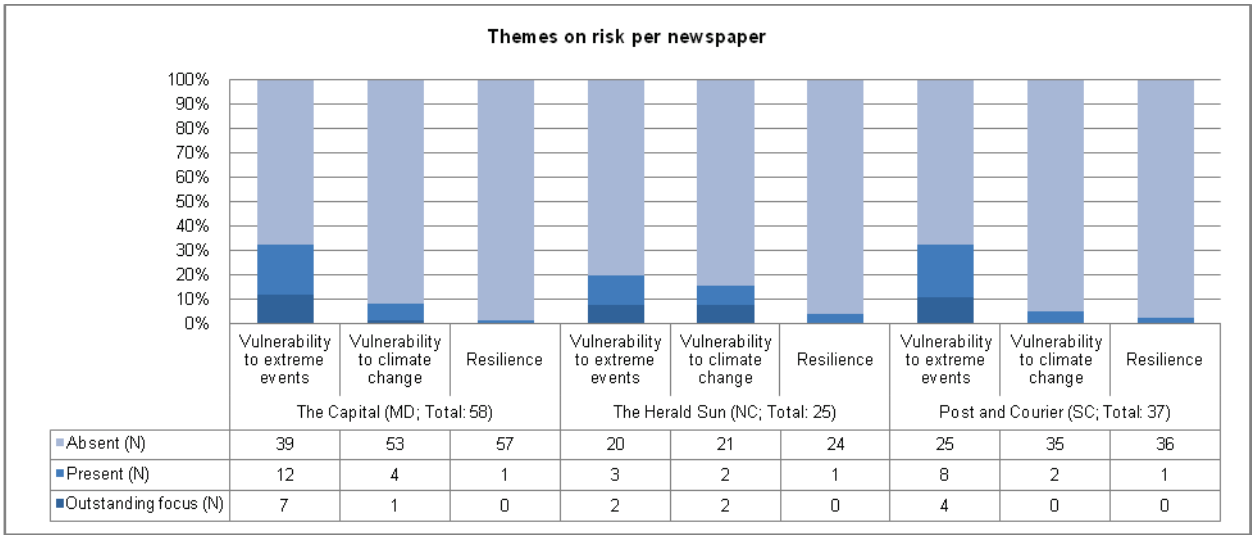
	Scientific facts	Scientific consensus	Scientific uncertainty	Political controversy	Scientific facts	Scientific consensus	Scientific uncertainty	Political controversy	Scientific facts	Scientific consensus	Scientific uncertainty	Political controversy
	The Capital (MD; Total: 58)				The Herald Sun (NC; Total: 25)				The Post and Courier (SC; Total: 37)			
Absent (N)	46	53	53	53	19	22	19	18	32	35	36	35
Present (N)	9	5	3	5	6	3	6	5	5	2	1	2
Outstanding focus (N)	3	0	2	0	0	0	0	2	0	0	0	0

10-1) Absolute and relative frequencies of themes on trust in science per newspaper



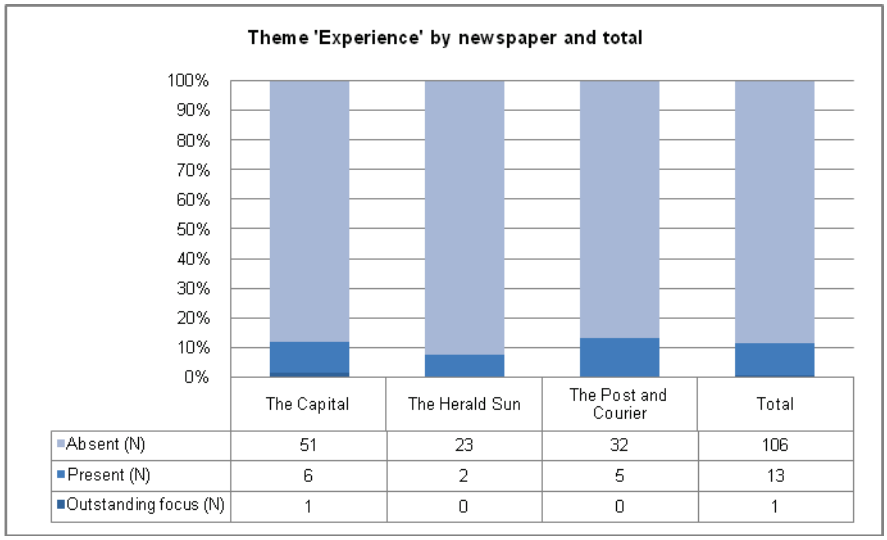
	Trust in technology	Trust in public action	Distrust in public action	Trust in technology	Trust in public action	Distrust in public action	Trust in technology	Trust in public action	Distrust in public action
	The Capital (MD; Total: 58)			The Herald Sun (NC; Total: 25)			The Post and Courier (SC; Total: 37)		
Absent (N)	50	48	50	24	23	23	31	32	25
Present (N)	7	7	6	1	1	1	6	2	9
Outstanding focus (N)	1	3	2	0	1	1	0	3	3

10-2) Absolute and relative frequencies of themes on trust in management per newspaper



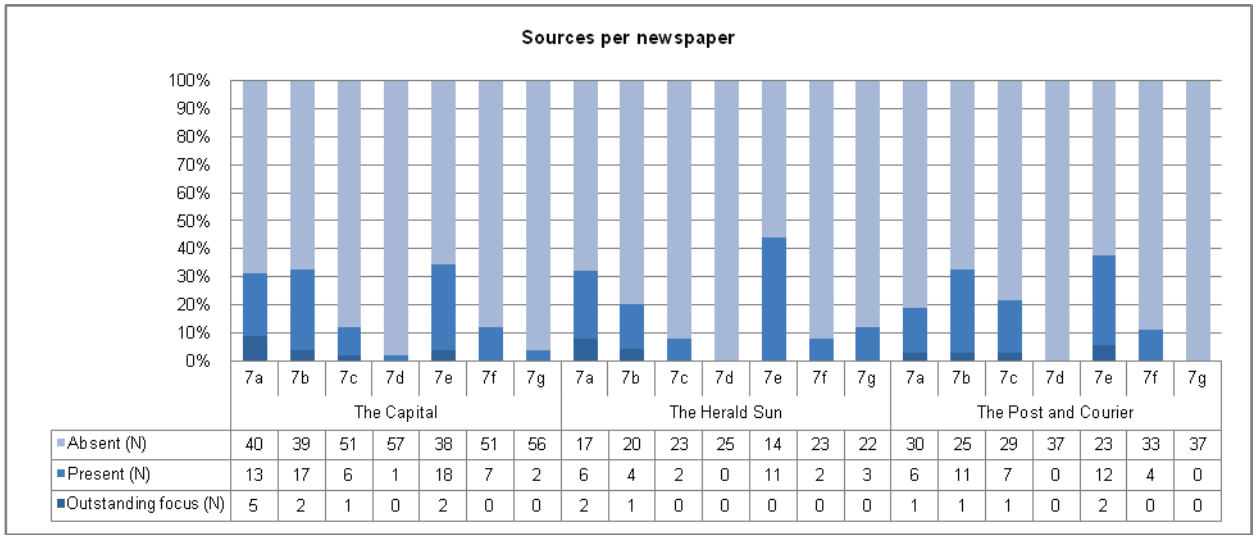
	Vulnerability to extreme events	Vulnerability to climate change	Resilience	Vulnerability to extreme events	Vulnerability to climate change	Resilience	Vulnerability to extreme events	Vulnerability to climate change	Resilience
	The Capital (MD; Total: 58)			The Herald Sun (NC; Total: 25)			Post and Courier (SC; Total: 37)		
Absent (N)	39	53	57	20	21	24	25	35	36
Present (N)	12	4	1	3	2	1	8	2	1
Outstanding focus (N)	7	1	0	2	2	0	4	0	0

11) Absolute and relative frequencies of themes on risk per newspaper



	The Capital	The Herald Sun	The Post and Courier	Total
Absent (N)	51	23	32	106
Present (N)	6	2	5	13
Outstanding focus (N)	1	0	0	1

12) Absolute and relative frequencies of theme 'experience' per newspaper and total



	The Capital							The Herald Sun							The Post and Courier						
	7a	7b	7c	7d	7e	7f	7g	7a	7b	7c	7d	7e	7f	7g	7a	7b	7c	7d	7e	7f	7g
Absent (N)	40	39	51	57	38	51	56	17	20	23	25	14	23	22	30	25	29	37	23	33	37
Present (N)	13	17	6	1	18	7	2	6	4	2	0	11	2	3	6	11	7	0	12	4	0
Outstanding focus (N)	5	2	1	0	2	0	0	2	1	0	0	0	0	0	1	1	1	0	2	0	0

13) Absolute and relative frequencies of sources cited per newspaper (7a: Academics; 7b: Residents; 7c: Business/Industry; 7d: Unaffiliated Research Group, Unaffiliated Expert; 7e: Governmental Authorities/Politicians; 7f: Environmental Groups; 7g: Others)

III. Institutional framework for action in coastal adaptation to climate change in the study area

The 'historical dependence on local property taxes' (Heinz Center, 2002, p. 35) creates a setting in which attracting increasingly valuable property at the ocean front is one of the main drivers in local politics (Heinz Center, 2002). This has serious implications not only because ongoing coastal development increases the risks of coastal disasters, but moreover because it constantly reinforces the need for coastal protection for property (of high value) at the ocean front[21]. The costs of disaster risk reduction facing coastal property owners are reduced with federal taxes through the National Flood Insurance Program, creating 'moral hazards' (Cutter & Emrich, 2006). Such hazards are further created at state level through the current disaster risk management system which 'encourages states to seek the maximum amount of available disaster resources, irrespective of the actual need, and may even contribute to the reluctance of state and local governments to take mitigation actions' (Heinz Center, 2002, p. 38). As disaster risk management at the shoreline is becoming more and more costly, vulnerable communities with little political influence are threatened by an increasing lack of support in disaster risk management because presidential disaster declarations under the Disaster Mitigation Act lack clear guidelines, and tend to be issued based on interests and power rather than needs (Heinz Center, 2002, p. 38). On top of that, the wealth gap between the affluent living at the shore and the poor living inland creates significant social problems as the 'geographical mismatch' (Cutter & Emrich, 2006, p. 103) between places of employment opportunities and where affordable housing is available drives low-income workers, particularly in the Southern states, to live in manufactured and mobile homes that provide little protection from natural hazards (Cutter & Emrich, 2006, p. 103).

[21] Mostly white, well-off residents tend to live along the ocean front, often protected by costly measures for their protection; whereas poorer, racially more diverse groups tend to live inland where they are equally exposed to the impacts from coastal storms and hurricanes but less protected (cf. Cutter, Mitchell, & Scott, 2000; Finewood, 2012; Cutter & Emrich, 2006). This is especially true in the Carolinas due to the 'longstanding history of racial and social inequalities' in the US Southeast (Finewood, 2012, p. 4). Recognition of this spatial segregation at local level is important in the discussion of unequal exposure to risks and injustices in coastal management.

Coastal Zone Management in Maryland

Maryland's coastal zone management is applying a network approach, i.e., various state agencies and local governments are involved in its implementation. It is administered by the Department of Natural Resources (DNR) and has the overall aim 'to achieve a balance between development and protection' (DNR, 2002).

An important component of Maryland's Coastal Zone Management is the ecological restoration of the Chesapeake Bay estuary, which has experienced severe damages from urbanisation since the 19th century and moreover is highly vulnerable to sea level rise and climate change. Shoreline erosion, a concern particularly on the eastern shore, has been addressed in the Shore Erosion Control Plan (SEC) by providing financial and technical assistance. The inundation of barrier islands has been fought with extensive replenishment actions supported by multiple agencies from federal to local level.

Conservation easements for shore protection and land use zoning in the surrounding wetlands through the Critical Areas Act are 'unusual land use conventions' (Nuckols, Johnston, Hudgens, & Titus, 2010, p. 543) facilitating natural shoreline development in Maryland. However, the state also recognises the right to fill wetlands and tidal waters to reclaim land lost to erosion. Coastal management in Maryland has been criticised for being fragmented, which currently hinders the implementation of a long-term strategy to address sea level rise.

Sources: (DNR, 2002; Johnson, 2000; Leatherman, 1995; Nuckols et al., 2010; Titus, 1998)

Adaptation to Climate Change

Within Maryland's Climate Action Program, adaptation to accelerated change in coastal areas has been identified as the most pressing issue in adaptation to climate change. Within the Program, the Chesapeake Coastal Service (CCS) is cooperating with local governments to support them in the definition and implementation of these strategies in the local context as part of the Coast Smart Communities initiative.

Source: (NOAA, 2012)

Box 1: Framework for action in Maryland

Coastal Zone Management in North Carolina

The foundation of coastal management in North Carolina's Coastal Area Management Act (CAMA) is the designation and controlled management of Areas of Environmental Concern (AEC) as defined by the Coastal Resource Commission (CRC).

Important management guidelines regarding the particular threats from rising sea levels and shoreline erosion are implemented in the Ocean Hazard AEC (*North Carolina Administrative Code, Title 15a, 7H s.03*), which entail a setback line for all developments made at the ocean shore as well as a 'no hardening rule'. The setback line allows property and setback boundaries to migrate inland as shores erode (Ibid., *s.0301(a)*). The 'no-hardening rule' prevents any hardened structure for property protection along the ocean front (Ibid., *s.0308(a)(1)(B)*). Estuarine shores had not been protected under the CAMA until the impacts from Hurricane Floyd in 1999 raised concerns about the vulnerability of riverine development. The Coastal Shorelines AEC established in response prohibits any new development within a 30-foot buffer along the entire shoreline (Ibid., *s.0209(d)(10)*).

Implementation of the CAMA further involves the establishment of planning programs by local governments demanding, amongst other things, the formulation of policies for addressing sea level rise. Nevertheless, until 2002 the latter was ignored by all local governments (Clark, Kassakian, & Titus, 2010), a situation that is unlikely to change given that land use planning is the prerogative of local governments (Moser, 2005, p. 360).

Sources: (Clark et al., 2010; Moser, 2005, p. 360; *North Carolina Administrative Code, Title 15a, 7H s.03)*

Box 2: Framework for action in North Carolina

Coastal Zone Management in South Carolina

South Carolina's Coastal Zone Management Program authorised under the *Coastal Tidelands and Wetlands Act of 1977 (CTWA)* was found to be inefficient shortly after its implementation. Development continued at the ocean front, which, just like the rest of the mid-Atlantic coast, is affected by coastal erosion, rising sea levels, and frequent storms. In response, the Beachfront Management Act was enacted in 1988. The Act's core policy is the development and implementation of a comprehensive long-term beach management plan for the entire coast, managing a gradual retreat over a forty-year period. The construction of hardened structures for protection is prohibited. At the same time, beach nourishment is strongly encouraged to be implemented wherever economically feasible. The retreat policy requires the definition of baselines and setback lines to be revised every 8 to 10 years. In addition to the management plan at state level, local governments are required to implement plans to ensure public access to beaches, disaster risk management, and achievement of the Act's goals at the local level by the end of the 40-year retreat period. If local governments fail to meet this requirement, they are not eligible for state support in beach protection and restoration.

Estuarine coasts are not managed under the Beachfront Management Act. Valuable habitats, watersheds, wildlife corridors, and significant historical and cultural sites are protected as part of the South Carolina Coastal and Estuary Land Conservation Program (CELC). However, coastal erosion and sea level rise are not addressed in the current draft for the CELC plan (cf. DHEC, 2011).

Sources: (C*TWA, 1977*; DHEC, 2011; Matheny et al., 2010; South Carolina Coastal Council, 1992)

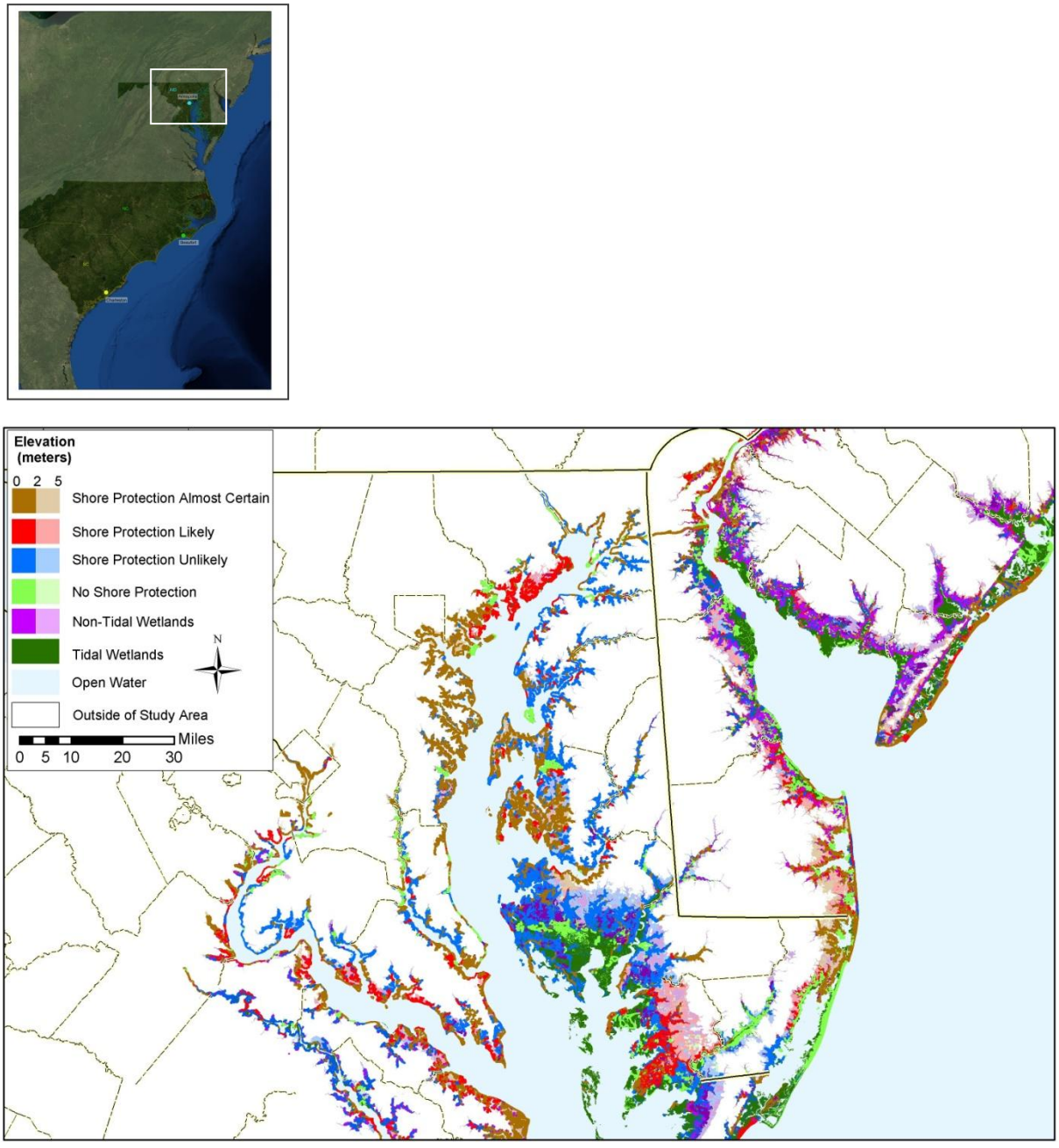
Box 3: Framework for action in South Carolina

IV. Maps

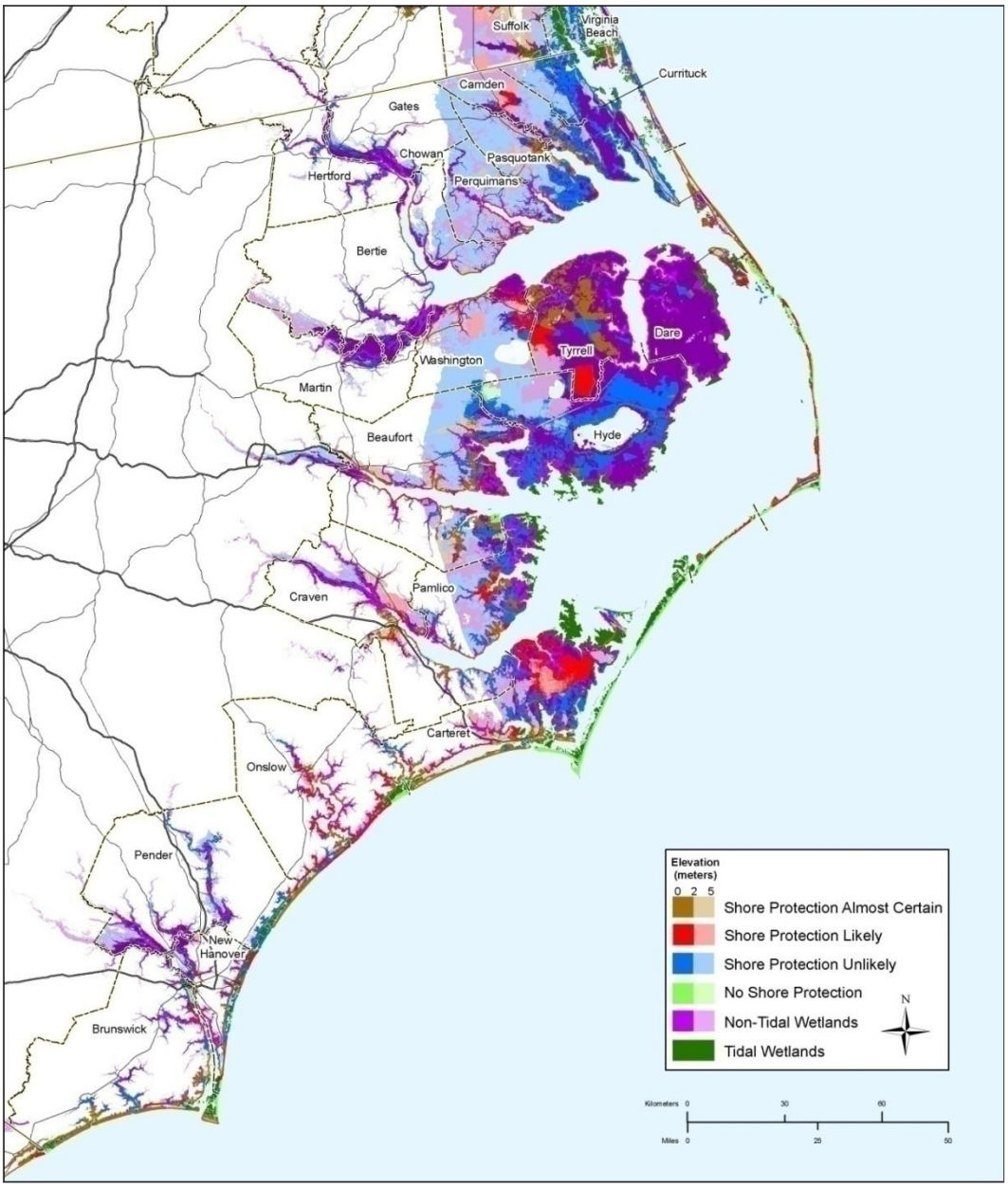
IV.1. Study area

Map 1: Study area. Source: own design, based on data from www.mobilegeographics.com/mapserver/MSrecipes.tar.gz

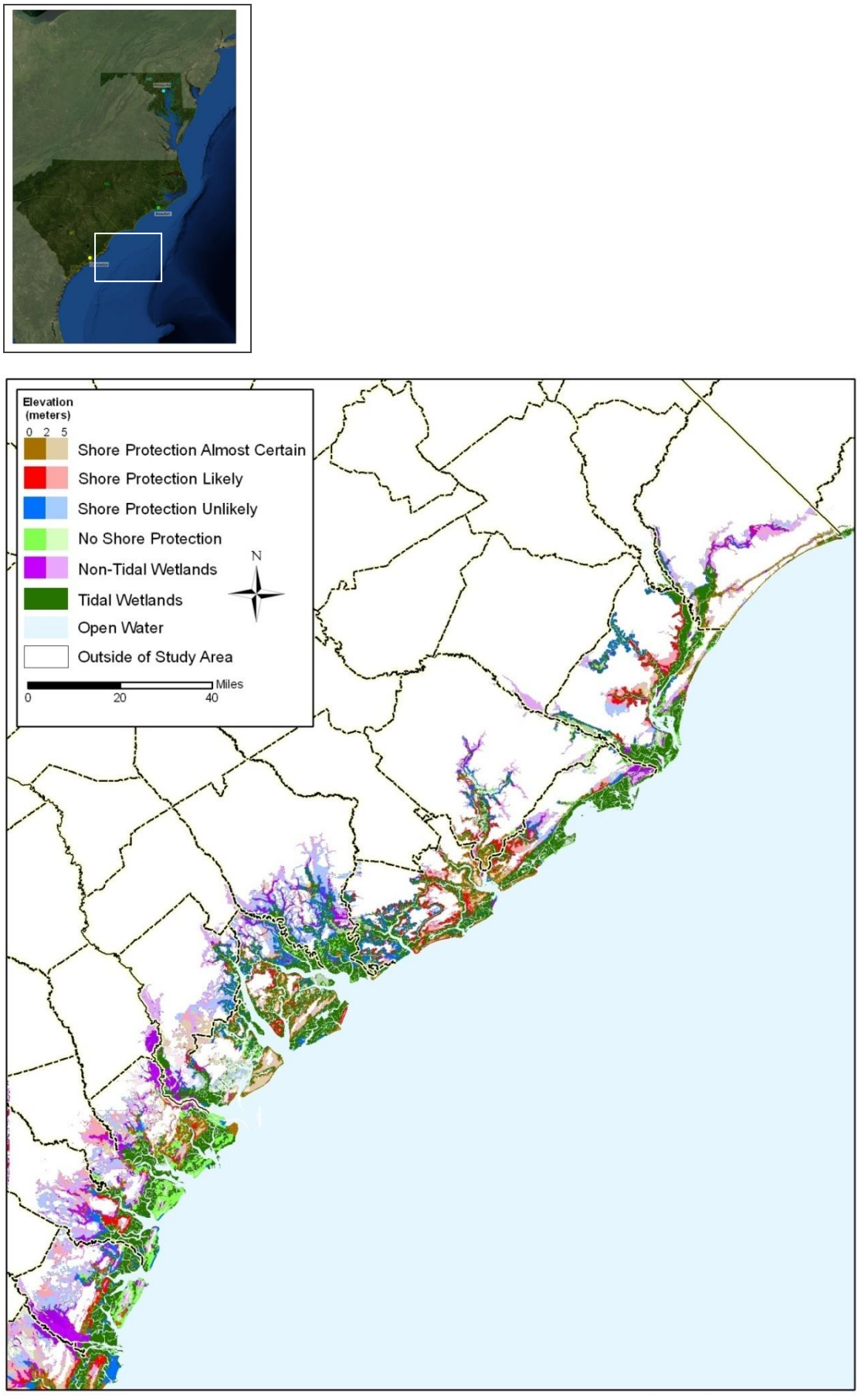
IV.2. Likelihood of shore protection



Map 2: Likelihood of shore protection in Maryland. Source: (Titus & Hudgens, 2010). The pattern shows a strong tendency towards armouring the coast (red & brown), particularly along developed coast inside the bay but also at the ocean front.



Map 3: Likelihood of shore protection in North Carolina. Source (Titus & Hudgens, 2010). The pattern shows a strong tendency towards protection of open ocean front and a retreat strategy on the peninsula between Albemarle and Pamlico Bays



Map 4: Likelihood of shore protection in South Carolina. Source: (Titus & Hudgens, 2010)

Imprint

Publisher
Ecologic Institut gemeinnützige GmbH
Pfalzburger Str. 43/44
10717 Berlin
www.ecologic.eu

Content by:
Fanny Frick
E-mail: fanny.frick@gmx.de

Web
http://www.klimzug-radost.de

ISSN 2192-3140

The project ‘Regional Adaptation Strategies for the German Baltic Sea Coast’ (RADOST) is financed within the initiative ‘Climate Change in Regions’ (KLIMZUG) by the German Ministry of Education and Research (BMBF).

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