

CLIMATE CHANGE ADAPTATION THROUGH COASTAL LAND USE MANAGEMENT: THE CONTEXT OF ENVIRONMENTAL JUSTICE

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Despite an increasing literary focus on climate change adaptation, the facilitation of this adaptation is occurring on a limited basis (Adger et al. 2007). This limited basis is not necessarily due to inability; rather, a lack of comprehensive cost estimates of all options specifically hinders adaptation in vulnerable communities (Adger et al. 2007). Specifically the estimated cost of the climate change impact of sea-level rise is continually increasing due to both increasing rates and the resulting multiplicative impact of coastal erosion (Karl et al., 2009, Zhang et al., 2004). Based on the 2007 Intergovernmental Panel on Climate Change report, minority groups and small island nations have been identified within these vulnerable communities. Therefore the development of adaptation policies requires the engagement of these communities. State examples of sea-level rise adaptation through land use planning mechanisms such as land acquisition programs (New Jersey) and the establishment of rolling easements (Texas) are evidence that although obscured, adaptation opportunities are being acted upon (Easterling et al., 2004, Adger et al. 2007).

Adaptive capacity is defined as the ability or potential of a system to respond successfully to climate variability and change, and includes adjustments in behavior, resources and technologies (Brooks et al. 2005). Various strategies to increase adaptive capacity are necessary to reduce the magnitude of harmful climate change outcomes. Even though socio-ecological systems have adapted to sea level rise over long time scales in the past, the adaptive capacity of today's coastal societies have been reduced due to size and permanence and this reduction is of due concern (Day et al. 2007, Morris et al., 2002, Nicholls 1995). Of further concern is the adaptive capacity of the inherent historical and cultural value of coastal societies which have depended on their connection to the land such as the Gullah Geechee nation.

Structures and processes that influence adaptive capacity have been revealed through vulnerability assessments (Eriksen and Kelly 2007). Generic vulnerability indicators which reveal adaptive capacity include income, education and health. However due to the synergistic impacts of climate change on these indicators, inquiry into climate change adaptive capacity indicators is also required. This inquiry should be defined by social and cultural limits. These limits in turn are related to the difference in risk perception and tolerance in between groups as affected by worldviews, values and beliefs (Adger et al. 2007). Diversity of understandings and perceptions influence access to decision-makers and therefore leads to the impediment or implementation of adaptive responses. These considerations emphasize the need for further research on the socio-economic costs and benefits of adaptation measures, specifically land use alteration and subsequent financial appropriations to facilitate timely adaptation (Adger et al. 2007).

Land use planning and decision-making in minority communities have been central to the environmental justice research community, whether directly or indirectly related to the siting of health compromising facilities in low-income or communities of color (UCC 1987, UCC 2007). These decisions have been pre-empted by limited estimations of social costs to those communities, similar to that heeded by the IPCC in 2007 in relation to climate change adaptation costs (Adger et al. 2007). Several of these impacted communities have been coastal, exemplified by the highly publicized impacts of Hurricane Katrina (Bullard and Wright 2009). Climate change impacts are projected to disproportionately affect these already pressured coastal communities (Hoerner and Robinson 2008). Therefore if not considered, these detrimental impacts on minority communities could be compounded by land-use climate change adaptation measures.

Based on this need to consider social and cultural aspects of land use planning adaptation, the assertions of the environmental justice research community of disproportionate climate change impacts are put into context and perspective. Justice in climate change adaptation is being increasingly addressed in the literature on the international scale. Paavola and Adger in 2007 have discussed the lack of a clear foundation for climate change adaptation in developing countries which does not resolve how the burden of funding ought to be shared and how the adaptation funds ought to be distributed. It can be implied that since a clear foundation for climate change adaptation between countries has not been identified on the international scale, there is also room to identify possibly differing factors for adaptation at the currently smaller scale of minority communities.

By 2050, the population proportionality of ethnic minorities will shift to more than 50%, necessitating further consideration of geographical and social vulnerability in land-use planning to avoid exacerbation of the disproportionality of climate change impacts (Cutter and Emrich 2006, Pollard and Mather 2008). It will therefore be useful to consider the principles of environmental justice in estimation of the impact and costs of land use adaptation to sea-level rise in minority communities. Within these principles, the statement which most directly considers the opportunities found within the land use decision-making process calls for the right to participate as equal partners at every level of decision making, including needs assessment, planning, implementation, enforcement and evaluation (FNPCELS 1991). Even further, climate justice principles have been established (Hoerner and Robinson 2008). Of these principles, response to climate change impacts is indirectly addressed through requiring the equal protection of all communities, regardless of race, gender, nationality, or socioeconomic status from the environmental, health and social impacts of climate change. Climate change adaptation is directly emphasized through stating that any solutions implemented to respond to climate change should not violate human or environmental rights and also through requiring that those most responsible for creating the impacts that arise from climate change to bear the proportionate cost of responding to the resulting economic, social and environmental crisis (EJCC 2009).

In this environmental justice context, one such example of a community, rather a nation within nation which faces the disproportionate cost of economic, social and environmental crisis is found within the Gullah Geechee Cultural Heritage Corridor.

In 2000, Congress authorized the National Park Service to conduct a special resource study entitled The Low Country Gullah Culture Special Resource Study. Consequently it was determined that Geechee Gullah people and our culture are of national significance to American culture and its history. Furthermore, as a result of the special resource study findings, Congress established the Gullah Geechee Cultural Heritage Corridor in 2006. There are 79 barrier islands, approximately 12,315 square miles along the southeastern coast from Cape Fear River North Carolina to the St. Johns River near Jacksonville, Florida, that make up the Gullah Geechee Cultural Heritage Corridor.

Moreover, The National Trust for Historic Preservation included the Gullah Geechee culture on its 2004 annual list of most endangered resources. With documented findings such as those by the National Park Service and The National Trust for Historic Preservation, it is imperative that solutions are implemented with legislative and financial support from the federal, state, and local governments conjoined with local community guidance.

Environmental injustice, specifically in the dynamics of the eradication of a culture, is a significant threat to the Geechee Gullah nation. The issue of climate change and adaptation directly impacts the Geechee Gullah communities that have called the eastern Seaboard home since the late 18th century. In the mid 20th century, the issues have become more profound from improper land-use decision making. Traditionally, developers have overlooked the geographical and societal environment, with economics emerging as the leading factor in the equation for decision-making on how to “develop” the coastal region.

The relative influence of humans on barrier islands: Humans versus geomorphology; defined as the study of the evolution and configuration of landforms. Humans are an integral component of barrier island systems throughout the world. The diversity of cultures (e.g., economics, politics) present has as much influence on barrier island evolution as the diversity of environments (e.g., climate) in which they are found. The actions of humans affect three inherent properties of barrier islands: (1) Each island is individually unique in its physical and ecological setting (affected by direct “local” human activity); (2) Each island is linked to a chain of adjacent islands through long shore transport (affected by “regional” activity elsewhere); and (3) each island responds dynamically to environmental change through cross-shore transport (affected by regional activity and shoreline stabilization).

Geomorphic carrying capacity is the resilience of barrier islands to human impacts. Geomorphic risk factors serve as a basis for predicting resiliency, providing both a measure of dynamic change (erosion rate and storm frequency) and available buffer space (island width and elevation). As risk factors increase, the dynamic and spatial character of an island comes into greater conflict with human landscape elements and is more likely to be altered. The relative influence of humans on barrier island evolution can be estimated by comparing the anthropogenic impacts on the three major island properties to the island's carrying capacity. When the three properties have been completely

altered, an island becomes entirely human-dominated, or “terminated.” Carrying capacity can indicate whether stabilization, retreat, or abandonment is the best long-term management option (Stutz and Pilkey 2005).

The Gullah-Geechee nation is responding to their environmental injustices, the threat of development and the potential threat of climate change in order to avoid the termination of their barrier island community. Their response incorporates the social and cultural aspects of climate change adaptation to sea-level rise on the barrier island community of Sapelo Island. This model of self preservation is both environmentally just and adaptive to climate change issues and is initiated by the Sapelo Island Cultural and Revitalization Society. The 25 acre cultural development is called the Geechee Gullah Cultural Interpretive Village Educational Complex, to be nestled within the Hogg Hummock Historic District on Sapelo Island, Georgia. The last of its kind in the state of Georgia, Hogg Hummock is a unique community comprised of primarily direct descendants of slaves brought from the “Rice Coast” of West Africa.

The decision making process for appropriations towards community-based initiatives that consider an island’s carrying capacity and adaptive capacity for climate change (*e.g.* Sapelo Island) can be supplemented by environmental justice research tools. For example tools created to prevent the disproportionate siting of unwanted facilities can be further applied to ascertain the siting of land uses agreed upon by all community members. Environmental justice research has led to the development of The Community Pollution Threshold Model (CPTM) (Stokes IV, 2009). The CPTM was designed to use sociodemographics as indicators of a Community’s exposure to atmospheric pollutant concentrations and associated health outcomes. The CPTM integrates 10 sociodemographic variables (*e.g.* minority, poverty, education, mean household income, et al.), the modeled atmospheric pollutants emitted from environmentally hazardous facilities (EHFs), and the rate of cancers and respiratory diseases associated with the modeled pollutant concentrations. The CPTM utilizes the standardized or beta coefficients obtained from the linear regression of the 10 independent sociodemographic variables and the dependent variable concentration. These beta coefficients are then multiplied by each respective sociodemographic indicator to produce a score for each community at the census tract block group level. A higher score indicates exposure to a higher concentration of atmospheric pollutants, which is arguably the result of unjust land-use practices.

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