

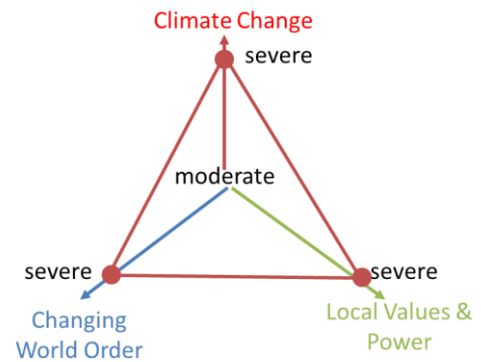
Appendix 2. Future scenarios as developed by the Cape Romain Partnership for Coastal Protection in the Lowcountry of South Carolina.

The four scenarios depict two extreme and two intermediate futures. The figures associated with the following scenarios describe the characterization of the three principal driving forces. The colloquial names of the scenarios are intended as memes, which the Partnership may or may not find useful.

Scenario 1: *The Three Horsemen*

There is little or no effective global response to climate change, and the backlash to globalization deepens and spreads over the coming decades. The U.S. greatly increases military spending and therefore can afford less social services. Isolationist policies embroil the USA in trade wars (leading to increased tariffs and trade barriers) and other protectionist policies. Global order is chaotic. The Lowcountry in turn is plagued by social, economic, and political upheaval and increased polarization.

Population growth continues, but fewer people are moving to the area by mid-century in response to declining environmental values and increasing coastal vulnerability. Society turns more inward looking, with politics becoming increasingly polarized, as people feel less in control of their lives. Local politics become less inclusive, less accountable, and more corrupt. People become more xenophobic; race relations become increasingly problematic. The gap between rich and poor continues to grow, adding to the breakdown of social cohesion. Tidal flooding and storm surge are a constant threat, impacting infrastructure and slowing economic growth. Local regulatory measures to combat local effects of climate change and urban sprawl are largely too little, too late. A sense of place and appreciation of cultural heritage declines, making community-based solutions increasingly difficult to attain. Unincorporated areas of Charleston County are particularly hard-hit; McClellanville is largely abandoned to the sea. Response to sea level rise comes largely in the form of coastal hardening to protect development and infrastructure. Ecotourism declines, and marine transportation jobs are hard-hit by increased tariffs and trade barriers. Economic growth is driven mainly by the health sector and increased military spending. Large segments of the population are increasingly vulnerable due to ageing of immigrant retirees, rural gentrification and lack of affordable housing, exposure to the impacts of climate change, and the inability of public services to keep pace with the rapid changes affecting the area.



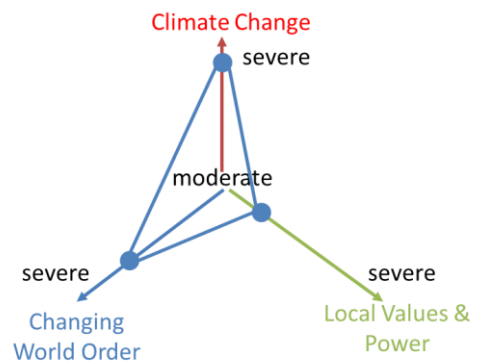
There is extensive environmental degradation by mid-century from a combination of unregulated growth, climate change, and the power wielded by commercial interests. Impacts include the rapid loss of barrier islands, accompanied by rapid conversion of marshlands to open water, in

turn diminishing the value of commercial and recreational fisheries. The loss of barrier islands also reduces habitat available to migratory birds and sea turtles. Water quality degradation (especially increases in coliform bacteria and salinity) leads to the commercial collapse of oyster and blue crab fisheries. Competition for clean, freshwater intensifies due to more frequent droughts and population growth throughout the state. Changes in precipitation patterns and increased flooding result in increased mosquito populations in low-lying areas, leading to higher risk of insect borne disease outbreaks. Rapid urbanization diminishes the aesthetic quality of the rural landscape and contributes to a decline in forestry.

Scenario 2: *United Front*

As in scenario 1, there is little or no effective global response to catastrophic climate change, and the backlash to globalization deepens and spreads over the coming decades; the U.S. greatly increases military spending and therefore can afford less social services; isolationist policies embroil the USA in trade wars (leading to increased tariffs and trade barriers) and other protectionist policies. Global order is chaotic, with shifting alliances and regional powers. Population continues to grow in the Lowcountry, at least through mid-century, attracting immigrants due to the desirability of the environment, culture, and lifestyle. Immigrants are anxious to maintain this lifestyle and so assimilate rapidly. This prevents a breakdown in social cohesion. Much of this social cohesion centers on appreciation for natural resources.

Government focus is on local economic development. Due to isolationist policies, economic drivers are heavy-industry based (i.e. Volvo, Boeing, etc.). This is bringing in more workers (educated, skilled) and employs locals as well. However, this also leads to some displacement of locals. For example, many of the infrastructure/road building contractors are bringing in their own people (not hiring locals). On the other hand, supporting industries are stimulated by the large economic drivers, such as the timber industry, which largely employs local labor. This also results in more blue-collar jobs as other associated business opportunities arise (supporting industries: welding, construction, other types of entrepreneurship, etc.). This does not solve income inequality or the urban vs. rural divide hence there is a “mixed bag” of economic opportunity. Heavy industry increases demand for energy and ecosystem services. This increases the marginal value of ecosystem services, increases development, and increases property values, which can affect access to coastal resources and lead to loss of property for those who cannot afford to live in this area in the “new” economic climate. Local governments act as necessary to protect the social-ecological system. City planners/administrators improve water treatment facilities and limit coastal development through zoning policies. Mayors, city council make educated zoning decisions based on projected sea level rise, flood zones, elevation, etc., along

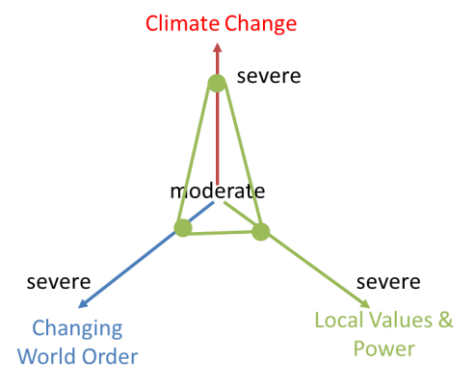


with key community stakeholders; community-based planning is emphasized. Conservation organizations (all levels) form partnerships to expand the promotion and implementation of environmental education and environmental engagement. Lowcountry “Local First” does outreach to promote positive impacts of local economic stimulus. Other local organizations promote the positive human health and well-being impacts of consuming local, for example Charleston Good. NGOs and University cultural/historic departments organize training to encourage entrepreneurship to meet increased demand for local culture/heritage. The effectiveness of these activities is enhanced by a strong place identity and social cohesion.

The local effects of climate change on ecosystem goods and services are rather severe, however. An increased frequency of extreme events (rain bombs, drought, tropical storms) is placing severe strains on public safety, human infrastructure, agriculture, and natural resources. Due to the increased frequency/severity of storms (i.e. rain bombs), more impervious cover affects storm water runoff as natural drainage systems are disrupted, providing less opportunity for carbon sequestration. More runoff and less drainage have an impact on access to clean water and affect coastal habitats through erosion and upsetting normal sediment transport systems. A lack of drainage (standing water) has human health implications, resulting in an increased risk of outbreaks of insect borne diseases, and increased storm severity affects access to social services (hospitals, etc.). Bird and turtle nesting failures increase due to more intense storm events, which impact the ecosystem services that these species provide (bird watching, aesthetic value, tourism, “being immersed in wilderness” value). Changes in precipitation patterns lead to more severe periods of drought and infrequent but severe rain storms result in extreme pollutant loading. Saltwater intrusion impacts freshwater aquifers as well as shellfish habitat (oysters, blue crabs). Intrusion also changes marsh composition, which upsets the needs of habitat-dependent organisms.

Scenario 3: *Real Life*

Global action and national policies to reduce emissions are helping moderate the worst impacts of climate change globally. Although local impacts by mid-century are less than some had feared, they are still placing strains on the resilience of the Lowcountry social-ecological system. Population continues to grow over the next few decades, principally through movement of people from other areas, but then begins to moderate by mid-century due to the cumulative effects of global change and their impact on local ecosystem goods and services; this contributes to a decline in a sense of place. Although the worst of global climate-change impacts have been



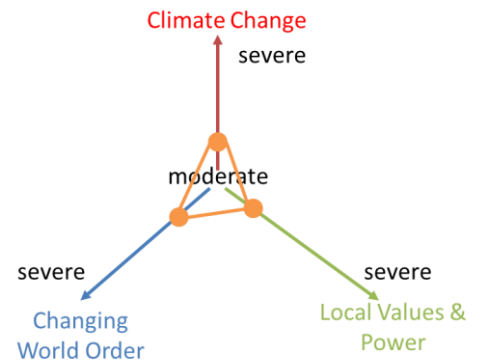
avoided, local effects are still moderately high. Sea level continues to rise and tidal flooding is approaching 180 times per year in Charleston. Local governments assume a strong role in adaptation to global change, supporting education, providing incentives to landowners, and implementing policies to control growth and protect the population from disasters. Charleston is successful at implementing its “Sea Level Rise Strategy” of reinvestment, response, and readiness. Local services are also robust to help mitigate the health and infrastructure risks associated with such extremes in climate change. Efforts to stem the decline of social cohesion are being effective. Strong community-based action is led by conservation NGOs and local governments, with the support of federal partners including Francis Marion National Forest and Cape Romain National Wildlife Refuge. These groups and institutions provide and support education, communication, and awareness that are helping to bring people together to confront global change.

As seas continue to rise and water quality continues to decline, however, impacts are taking their toll on ecosystem goods and services, affecting freshwater supply and quality, fisheries, recreation, tourism, and biodiversity. Nonetheless, with federal, state, and local support, Francis Marion National Forest and Cape Romain National Wildlife Refuge secure additional properties through fee-title and easement to provide for marsh migration and to enhance habitat area and connectivity. Effective ways are found to use spoil for replenishing beaches and building nesting islands for migratory birds.

Scenario 4: *Manna*

Global action on climate change is strong and effective, in part driven by rapid advances in technology. Developed and developing nations come to agreements about how to share (and enforce) the costs of mitigation and adaptation. Democracy and participatory governance spread in a more stable world order, leading to a greater sense of individual empowerment. Nation states preserve their identities, but there is a greater awareness of our global interconnections and our responsibility to future generations.

Local political power becomes more distributed, with NGOs, churches and other organizations playing a large role in generating community-based solutions. With support from the federal government (including Francis Marion National Forest, Cape Romain National Wildlife Refuge, and others), communities rely more on incentive-based adaptation measures and less on regulatory ones. Ecotourism continues to flourish, and marine transportation sees strong growth due to modern, fair-trade policies. Economic development is more egalitarian, with smart growth designed to protect a diversity of local values, especially abatement of flooding and



storm surge. Federal funding is available to protect or retrofit infrastructure at risk due to global change, especially in Charleston to help prevent tidal flooding. Local communities support programs of adult education and training, and the area becomes more attractive to hi-tech industry. Social services are sufficient to support at-risk populations. Community cohesion is high due to desire to maintain Lowcountry local identities; this fosters support for local and sustainable products.

Less climate change and more geopolitical stability helps Lowcountry communities do better at protecting and preserving cultural values and local ecosystem goods and services. Less extreme changes in precipitation patterns leads to fewer threats to human health, and those threats that do emerge are more easily addressed through robust social services. Sea level rise continues and approaches 1 foot by midcentury and is the principal effect of climate change. Ecosystem goods and services are impacted by sea level rise and population growth, but society is spared the worst effects. Fisheries are negatively affected due to loss and degradation of habitat, especially commercial fisheries for oysters and blue crab. Recreational fishing continues to be a strong draw to the area. The timber industry remains viable, with longleaf restoration providing more resilient forests. Some threatened and endangered species do better (red-cockaded woodpecker) while others (sea turtles) continue to decline. Coastal populations of seabirds continue to decline due to widespread habitat loss on the Atlantic Coast.