

Research Article

State and Local Climate Change Adaptation and Mitigation: Developing Leadership Strategies Through the Delta Regional Authority

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Abstract

Climate change has become a fixture in transnational proceedings as evident in Paris 2015. Although policy negotiations are occurring at the global level, state and local governments will be increasingly relied upon to implement strategies for adaptation and mitigation of the impacts associated with climate change. An overview of the policy process is offered with emphasis placed on state and local governments. The use of the IPCC Report is essential to understanding the mitigation and adaptation needs of the region. A survey of potential impacts is provided. This paper considers the level of scientific and policy knowledge of leaders identified through the federal government program's Delta Regional Authority. Then, through the use of survey data and analysis, this paper will consider options available to those in at the state and local governance level.

Introduction

Climate change is a naturally occurring phenomenon that impacts every aspect of life on Earth. However, as human activity increased the amount of carbon dioxide (CO₂) in the atmosphere to levels not seen in thousands of years, it became clear that anthropogenic (i.e., energy, cars, deforestation) was to blame for tipping levels past 350 parts per million [1]. Again, the science behind climate change being caused by (not correlated to) CO₂ was first discovered in 1896 by Svante Arrhenius and later confirmed by Charles Keeling in 1957 [2].

In June 1986, the Senate Environment and Public Works Committee Subcommittee on Pollution held the first hearings on greenhouse gas (GHG) emissions and the connection to climate change, or then called global warming. Within eighteen months, the Montreal Protocol had been developed to address the depletion of the ozone layer and the global community was well on its way to establishing a transnational governance structure to address other heretofore air pollutants. Bill McKibben (1989) wrote the amazingly influential *The End of Nature* [3] and Al Gore (1992) followed up with his more accessible work *Earth in the Balance* [4].

Still, a series of international conventions and conferences did not produce the national policy-making shift that many assumed would occur following Kyoto or Bali or Copenhagen or, the latest, Paris. Still the United Nations Framework Convention on Climate Change (UNFCCC) is largely the customary treaty used as a beginning point for negotiations [5].

Yet, the controversy over climate change remains. To be sure, "different individuals may weigh evidence differently and adhere to different standards of demonstration, and these differences are likely to be amplified when the results of inquiry have political, religious, or economic ramifications" [6]. Skeptics or those simply with an agenda (i.e., political, economic) may seize upon commonly used scientific expressions, like "uncertainty" or "risk", and manipulate citizens and policy accordingly. With climate change, it is "not as a lack of scientific understanding but as the lack of coherence among competing scientific understandings, amplified by the various political, cultural, and institutional contexts within which science is carried out" that is

the central discussion and NOT whether it is "real" or "man-made" [7]. Lenton et al and the IPCC largely agree. Neither would support status quo economics or continued GHG emissions at the present rate or politics where the potential for "tipping" remains a significant risk [8]. The science is now very clear.

But, science does not always precede policy-making as the former is forced to play 'catch-up' with the latter. Some researchers believed that "environmental scientists should be aware of the policy uses of their work and of their social responsibility to do science that protects human health and the environment" [9]. Yet, not everyone is enamored with the precautionary principle. Sunstein referred to it as advancing fearful science that advances "incoherent and paralyzing policy-making" [10]. Others have argued that depending on cultural, societal, political and religious values, a community or nation-state may have varying degrees of risk-tolerance thereby making the precautionary principle so open for interpretation that it is worthless to policy-makers [11]. Uncertainty as used by science is not the same as "we just don't know".

Perhaps, as Nisbet suggests, science needs to do a better job in framing the issue in a manner whereby local and regional stakeholders can understand and take action [12]. Some have suggested that both the public and the policy-makers cannot filter out what is peer-reviewed and what is trade journals [13]. As a result, those in Congress looking for a reason to doubt (i.e., ideological, economical), can find an all-too-willing support system to either prevent, delay or obfuscate climate change policy.

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Climate change policy seemingly must be the result of Congressional acts that authorize federal agencies to implement policy through rule-making. The concern is that Congress (today) cannot pass meaningful climate change legislation because it is stymied by ideological differences resulting in chaos [14]. Consider the *American Clean Energy and Security Act* (2009). The legislation was authored by Representative Henry Waxman (Democrat-California) and Representative Henry Markey (Democrat-Massachusetts). Waxman in particular was able to shepherd the bill out of committee and despite lukewarm support by President Obama passed it 219-214 in June 2009. Still, the Senate had other ideas. Jurisdiction for the bill fell in Agriculture, Commerce, Finance and Foreign Relations committees and lacking White House support, this bill was destined to never make it to a vote. By the time Senators John Kerry (Democrat-Massachusetts), Joseph Lieberman (Independent-Connecticut) and Lindsey Graham (Republican-South Carolina) attempted to expand the surface area for support, discussions of GHG caps, trade systems, and carbon taxes were eroding any prevalent bipartisan backing [15]. More recent Congresses have seen comparable results although more bills are passing that accentuate the need to reduce CO₂ emissions as it relates to climate change. Mitigation through insurance and emergency response seems to be able to pass without too much political wrangling [16].

Still, this impasse is not all that different from past controversial issues where Congress and President were ineffectual and the Supreme Court had to take the lead. For example, Congress had the ability (not the votes) to pass a law regarding women's reproductive rights. But, it took the Supreme Court in *Roe v. Wade* (1973) to legalize abortion. The Courts again will be where the battle over climate change will take place until Congress either passes a comprehensive law or federal agencies will be authorized to expand the scope of their authority. The fact is that it took the Supreme Court in *Massachusetts v. EPA* (2007) to jumpstart climate change talks by giving a regulatory body extraordinary deference in promulgating rule-making on CO₂ as a pollutant by way of the Clean Air Act [17]. Whether and how the EPA will exercise this court-backed power to regulate beyond what Congress authorizes remains to be fully understood.

Literature Review

The Intergovernmental Panel on Climate Change (IPCC) was "created not to foster new research but to compile and assess existing knowledge on a politically charged issue" [18]. There are few issues more politically charged than climate change. With regard to the swiftness of any changes, a National Research Council Report was stated that "A key characteristic of these changes is that they can come faster than expected, planned, or budgeted for, forcing more reactive, rather than proactive, modes of behavior" [19]. The following year, that same group called for "an abrupt change early warning system (ACEWS) if societies are to be resilient to climate change" [20]. According to the IPCC Summary for Policy Makers, assessments of climate and weather events juxtaposed with scope (i.e., from global to regional) decrease in certainty from "virtually certain" or "very likely" to "medium confidence in some regions" [21]. According to the IPCC: "Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased" [22]. Notice the word "unequivocal" and then the word "unprecedented." That is about as strong as any other assessment by the Working Group. Perhaps, "virtually certain" may contain such muscle, but not by much. So, if the IPCC (which assesses scientific reports across the globe) has objectively declared climate change both real and the causes to be anthropogenic.

This problem is likely to remain because of the following: a) climate change is too complex and policy options too expensive for one nation or region to act unilaterally; b) scientific knowledge has accumulated at the global level and not been as advanced at the local or regional level; and c) local and regional variations in weather (not climate) often present paradigmatic misunderstandings about climate change. Yet, as researchers in the UK concluded, "A greater emphasis must be placed on the negotiation of partnerships that are more sensitive to local diversity, and which involve a more equitable distribution of responsibility between different environmental stakeholders" [23]. In diverse states (i.e., the US), it is essential that local and regional become part of the process for making policy and deciding how to best allocate resources.

The impact for state and local governments has been known for quite some time. As early as 1989, the Environmental Protection Agency (EPA) had published a report detailing the potential for climate change to impact, inter alia, local water sources, infrastructure and health-care [24]. But, federal inaction and, often, a confusing array of scientific statements, has caused many state and local government agencies to either take up the cause of regulating GHGs or more inaction. States like California and New York have developed their own responses to carbon-centric fuels [25]. In fact, this has often lead to the bottleneck in Congress: liberal environmentalists from the two Coasts not being able to find common ground with moderate Democrats in the hinterland [26]. Still, many states in the south and central part of the US, often heavily dependent on coal for energy, have been slow to respond or have been vocally against any climate change policy [27]. State and local leaders lack a basic understanding of the science of climate change and therefore their communities remain most vulnerable to climate change because they lack essential adaptation and mitigation technologies, information, expertise and funding required to address this complex issue.

According to the IPCC report, state and local governments around the world are beginning to adapt to the projected new world by investing in energy infrastructure, especially in new sources of energy that are not carbon-based (i.e., solar, turbine, geothermal) [28]. However, this will be a major effort to mitigate the impacts of climate change as so many communities are along vulnerable coastlines or in areas where sea-levels have begun to rise. Perhaps nothing underscores the impacts of climate change on a local (indigenous people) and the inability of state and local governments to properly respond than the Native Americans that will have to be resettled from Isle de Jean Charles (southeast of New Orleans, Louisiana) [29]. Millions of dollars of federal monies will be needed to accomplish this. According to the National Climate Assessment, coastal impacts from climate change will be among the worst as people and infrastructure must be moved [30]. Consider projections made by the IPCC from the National Research Council report. Sea level around these areas could increase by as much as one meter; however, some projections have the sea rising by more than six meters [31].

Mitigation and Adaptation

The IPCC report provides governing principles for adaptation. First, adaptation is place- and context-specific and there is "no single approach for reducing risks appropriate across all setting" [32]. Scattering generation across many grids (e.g., distributive generation) is an option [33]. Incorporating older systems with renewable based systems is something the Europeans call "smart-grids" and these are being developed across the continent [34].

Mitigation. The reduction or removal of CO₂ from the atmosphere from anthropogenic sources may only stabilize where we stand right now [35]. Mitigating the effects of climate change on energy infrastructure is tricky. The IPCC defines mitigation as "a human intervention to reduce the sources or enhance the sinks of greenhouse

gases” [36]. The energy sector is a large part of the CO₂ emissions problem. So, climate change is both caused from and will impact the energy sector. In order to mitigate any effects here, it may be imperative to consider these as “co-benefits.” For example, reduction in demand due to increased public transportation or use of bicycles may have a twin health benefit. Permitting only those power stations that are further inland and have levees and are part of a smart-grid with renewables could have the advantage of being more secure from terrorism and thereby be a plus for national security.

Adaptation. The researchers used the IPCC definition of adaptation: “the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate” [37]. The IPCC has found that many regional and local (e.g., municipal) governance entities have already begun making adaptations for their energy infrastructure systems. The framework for this is represented in the schematic to the right. Governments must begin the process of “scoping” in order to identify risks and vulnerabilities to their energy systems to establish a criteria or a set of priorities for mitigating the impacts. This also requires monitoring implementation and constant analysis of results and other alternatives as they arrive [38]. Researchers have shown that citizen input is essential, especially with energy usage and demands [39]. An aspect of governance that has yet to be worked out is how to claim land according to the new demands for energy infrastructure [40].

Stabilization Wedges. Related to both the mitigation and adaptation recommendations of the IPCC and others, is the concept of “stabilization wedges” where existing technologies gradually reduce CO₂ emissions by 2055 [41]. Various “wedges” would be stacked and the resulting reductions would prevent a massive acceleration of GHGs. The point here is that energy systems already have technologies to ‘save’ it from the effects of climate change and not be based on business as usual (BAU). For example, smart-grids can distribute energy demands according to sources and include renewables. Also, levees are an ancient technology that could be built around power stations. New power lines and grids can be built further inland. In terms of new sources (i.e., solar, geothermal, wind, nuclear fission) and reduced demands (i.e., improved fuel economy, reduced use of cars, energy efficient homes and buildings), energy infrastructure fits well within the stabilization wedge.

Still, it often comes down to economics. The Stern Review [42] kicked off a firestorm among environmental economists (and others) due, in part, to the use of a lower discount rate. First, a discount rate, or discounting, is a commonly used tool for developing cost-benefit analyses by offering a value for future costs (or benefits) in today’s dollars. Typically, higher discount rates over long-terms will negate the necessity of most projects; whereas lower discount rates (like the one used by Stern) will demonstrate the significance of a public policy investment/expense [43]. Nordhaus was one that took exception to Stern’s lower discount rate (and lack of peer-review and methodological issues, which are actually more important criticisms) claiming that the review used extreme measures to justify action being taken immediately and for the long-term even at the expense of world GDP. He suggests that Stern could have used many other commonly used rates (i.e., interest, Treasury bond yield) but chose a lower rate for political and not scientific reasons [44]. The question of whether Stern chose the right discount rate or not cannot be answered. As Koopmans (1965) lamented, he did not “feel comfortable” with *a priori* choices about optimum criteria without some sense of alternative choice outcomes [45]. So is the case here: too complex, too long of a time frame and too many variables.

Thus, another approach has emerged. The Global Climate Change

Initiative (GCCCI) aims to produce more “clean, green energy” and provide assistance through low- or no-interest loans and grants to low-income countries to reduce their emissions and provide for a more stable energy infrastructure [46]. A further report calls on more than forty US agencies to develop adaptation strategies to climate change [47]. There is little uncertainty about whether climate change is causing coastal erosion and sea levels to rise and therefore impacting energy infrastructure along the coasts throughout the world. The issue of uncertainty is how global issues impact local communities. Some researchers have cited this as “a limiting factor” for cohesive policy-making at the local level [48]. This is often manifested in media or the public remaining skeptical of what to do and who to blame for climate change [49].

However, after a series of reforms and changes to federal funding mechanisms for states, some have argued that it is state policy-making in the environmental sector that, inter alia, has resulted in better air and water policy (and subsequent results) [50]. The states must play a role similar to what Madison called “laboratories for political innovation,” [51] but at some point there must be a clear unified voice from the federal level. Additionally, state and federal agencies employ intergovernmental agreements to tackle issues that hitherto have perplexed all governance bodies [52]. Unfortunately, it will be the states that get the bulk of criticism as they are charged with enforcement [53]. There have been efforts by states to develop a Memorandum of Understanding (MOU) with other states, like the Regional Greenhouse Gas Initiative (2005), which included mostly northeastern states [54]. But, this effort really made little impact and had virtually no chance of being replicated in heavy fossil fuel states. Thus, the need in the US for a federal organization (with access to federal dollars, expertise and organization) with a state and local governance (where there may be more political will than Congress) focus would be essential.

The Delta Regional Authority

There are divergent policies among the federal government and the states and local governments on GHGs and CO₂ emissions reductions [55]. Yet, those agencies working closely with state and local governance structures (not in a regulatory role like the EPA Regions) may be best poised to facilitate climate change policy. As Lutsey pointed out, much of the climate change policy being made in the US today is coming from state and local initiatives, but still lacking federal support [56]. Almost forty years ago, researchers suggested that federal authorities could be the best entities for encouraging compliance with the new federal requirements under, for example, the *Clean Water Act* (CWA) [57]. This is not uncommon in the European Union (EU) [58] or in Australia [59]. In Canada, regional economic authorities have pushed modernization efforts where a more centralized program was less successful [60]. Community development authorities often have the ability to encourage innovation, adaptation and diffusion of policy and technical alternatives in ways that regulatory agencies cannot [61]. Specifically, on the issue of climate change policy, much of the innovation is taking place at the state level with local governance entities being forced to manage mitigation and adaptation efforts without federal direction or funding [62].

In the US, such agencies that could also play a role in developing policy and mitigation and adaptation strategies with their state and local communities are the Appalachian Regional Commission (ARC), the Delta Regional Authority (DRA), the Denali Commission (DC), and the Northern Great Plains Regional Authority (NGPRA). The researchers here selected the DRA due to access to the authority, familiarity with its programs and proximity to its service area [63].

On October 1, 1988, President Reagan signed into law the Rural Development, Agriculture, and Related Agencies Appropriations Act for FY1989 [64]. Title II of that act, known as the Lower Mississippi Delta

Development Act, authorized the creation of the Lower Mississippi Delta Development Commission (LMDDC), and appropriated \$2 million to carry out the activities of the Commission [65]. As outlined in the authorizing statute, the Commission's legislative mandate was to identify the economic needs and priorities of the Lower Mississippi Delta region, and to develop a 10-year economic development plan for the region. The act established the administrative structure of the Commission to include two commissioners appointed by the President and seven by the governors of Arkansas, Illinois, Kentucky, Louisiana, Mississippi, Missouri, and Tennessee, or their designees [66].

In 1996, a major report was published that showed how vibrant this part of the US could become if infrastructure dollars were invested to connect it to markets so that it became a global trading zone [67]. Within a couple of years, ten federal agencies had signed a Memorandum of Understanding (MOU) with the Commission to cooperate and "revitalize" the Delta [68]. In 2000, Congress passed the Consolidated Appropriations Act that included two provisions that formed the basis for the Delta Regional Authority. The chairman (and co-chairman) of the DRA is nominated by the President and approved by the Senate. Further, Governors or designee from each of the eight participating states serves on a governing board. The DRA may approve grants to States (and local governments) and non-profit entities for purposes of infrastructure, job-training, business development and employment related education [69]. Further to the DRA's authorization, they are charged to serve as a liaison between State and local governments, nonprofit organizations (including community-based groups and educational institutions), the business community, and citizens that:

- Are involved in multijurisdictional planning;
- Provide technical assistance to local jurisdictions and potential grantees; and
- Provide leadership and civic development assistance [70].

An important feature of the DRA is the split between a federal and member states on a 50-50 basis. Their mandate is to work with counties in economic distress to create opportunities for community development. That may include infrastructure, literacy, health-care initiatives or leadership training. The leadership training is primarily conducted by the DRA in cooperation with universities in the service area. According to the DRA website, the Delta Leadership Institute (DLI) has "worked to improve the decisions made by community leaders across the Delta by broadening their understanding of regional issues, building a corps of alumni that have a regional and national perspective, developing a toolkit of resources for addressing issues facing their local communities, and providing the training and professional development needed to extend the pipeline of skilled local leadership within our Delta communities."

So, every year, community leaders from across the DRA service area are nominated, selected and spend several months attending training workshops throughout the Delta and in Washington, DC. Since these leaders represent the interests and knowledge and political-will of their respective communities and will be at the forefront of developing state and local climate change policy and effecting mitigation and adaptation strategies, the researchers here surveyed them.

Potential Climate Change Impacts

Specific to the region serviced by the DRA are potential climate change impacts that could challenge any local governance entity. The National Academy of Science (2009) detailed many of these potential impacts and this section will summarize the major ones [71]. The obvious first place to start deals with sea-level rise and increased

flooding. The loss of sediment along the Mississippi River Delta, including as far north as southern Illinois, means limited capacity for wetlands and other systems to uptake additional nutrients and aquatic loading [72]. Following the Hurricanes Katrina and Rita, while not directly tied to climate change it did provide researchers with a glimpse into the future, efforts to stabilize levees, coastlines and expand wetlands have been underway [73]. Flooding and nutrient management complications with coastal and riverfront properties are ubiquitous as evident along the Mississippi River and in other deltas around the world [74].

Next, energy infrastructure impacts may be substantial. Too many power stations are too close to vulnerable areas that could become flooded over the life of the plant [75]. Does that mean that the DRA service area will move all facilities further inland and eliminate its dependency on fossil fuels? Too much of the DRA area is dependent on coal and oil to make a wholesale change, but 'greener' alternatives such as solar, wind turbines and geothermal may be supplemental sources [76]. Still, according to researchers, green energy must be complimented with green building materials and design to reduce CO2 emissions from the construction sector [77]. A US Department of Energy report found that extreme weather conditions are likely to produce increased outages and an inability to provide a quick response due to flooding, especially in rural areas [78].

The IPCC's report on mitigation contains several other areas that the DRA service area must be concerned about. These include the following:

- Drought impacts on agriculture;
- Deforestation and soil erosion;
- Suburban residential and office space locations; and
- Further impacts on the disparity of income [79].

Transportation is another sector that must be deliberated. In the National Climate Assessment report (2013), public transportation (essential to having fewer cars using fossil fuels on the roads) must factor in several new variables in a changing world. For example, a hotter world with more torrential rain events may require modifications to bus schedules or train timetables [80]. This may mean that communities in the DRA region will have to alter their bus routes, develop new infrastructure or eliminate planned train upgrades.

There are at least two areas that may not be obvious, but must be considered by state and local governance structures. First, the dissemination of information, especially to those most vulnerable, is essential [81]. If Hurricane Katrina taught emergency responders anything it was the need for a clear message. Climate change policy will be much more complex and the DRA may need to get started sooner than later. For certain, the information required in communities that hitherto have been historically disenfranchised must progress. Next, "human-induced climatic changes often act in concert with environmental, demographic, and social stressors that variously influence regional food yields, nutrition, and health" [82]. There will be considerable health issues that must be managed under a world with climate change. The IPCC offered a wide array of health-related management issues that must be mitigated by state and local governments [83]. While many of the illnesses will be related to exposure to extreme heat or from standing water following floods (i.e., increased mosquito-borne illnesses), "most climate-related health risks are mediated via the influences of climatic changes and shorter-term weather fluctuations on food yields, water flows, patterns of infectious diseases and the movement or displacement of groups and populations" [84]. Some researchers have suggested that once communities have been proactive and made necessary adaptive

changes, the new, 'greener' communities of the future will have healthier people and a smaller carbon footprint [85]. Others have suggested that air-borne illnesses from GHG emissions may have a positive impact on lung ailments [86]. Perhaps, the homes and offices of the future will be healthier [87]. Unfortunately, that may be many years from now. Current leaders in the DRA service area will be called upon to manage issues effecting this generation.

References

1. Stern DI, Kaufmann RK (2014) Anthropogenic and natural causes of climate change. *Climatic change* 122: 257-269.
2. Seinfeld JH, Pandis SN (2012) Atmospheric chemistry and physics: from air pollution to climate change. John Wiley & Sons.
3. McKibben Bill (1989) The end of nature. Random House Incorporated.
4. Al Gore (1992) "Earth in the balance. Ecology and the human spirit." Boston, MA.
5. Kyoto Protocol. Available at <http://unfccc.int/resource/docs/convkp/kpeng.pdf>.
6. Oreskes N (2004) Science and public policy: what's proof got to do with it? *Environmental Science & Policy* 7: p.363.
7. Sarewitz D (2004) How science makes environmental controversies worse. *Environmental science & policy* 7: p.385.
8. Lenton TM, Held H, Kriegler E, Hall JW, Lucht W, et al. (2008) Tipping elements in the Earth's climate system. *Proceedings of the National Academy of Sciences* 105: 1786-1793.
9. Kriebel D, Tickner J, Epstein P, Lemons J, Levins R, et al. (2001) The precautionary principle in environmental science. *Environmental health perspectives* 109: 871.
10. Sunstein CR (2005) Laws of fear: Beyond the precautionary principle (Vol. 6). Cambridge University Press.
11. Foster KR, Vecchia P, Repacholi MH (2000) Risk management. Science and the precautionary principle. *Science* 288: 979-981. [[crossref](#)]
12. Nisbet Matthew C (2009) "Communicating climate change: Why frames matter for public engagement." *Environment: Science and Policy for Sustainable Development* 51.2 : 12-23.
13. Fischhoff B (2007) Nonpersuasive communication about matters of greatest urgency: Climate change. *Environmental science & technology* 41: 7204-7208.
14. Matthews R (2015) Congress and Chaos: Reexamining the Role of Congress in Combating Climate Change. *McGeorge L. Rev* 47: 1-139.
15. Center for Climate and Energy Solutions. 111th Congress Climate Change Legislation. Available at <http://www.c2es.org/federal/congress/111>.
16. 113th Congress passed several of these including the Disaster Relief Appropriations Act. Still, these are hardly climate change policy acts with comprehensive CO2 reductions. Bills considering the banning of rule-making when including the "social costs of CO2" emissions have become vogue.
17. 127 S.Ct. 1438.
18. Oreskes N (2007) The scientific consensus on climate change: how do we know we're not wrong? Climate change: What it means for us, our children, and our grandchildren, p.68.
19. Committee (2013) Abrupt Impacts of Climate Change: Anticipating Surprises. National Academies Press.
20. White JW, Alley RB, Archer DE, Barnosky AD, Dunlea E, et al. (2014) Abrupt impacts of climate change: anticipating surprises. In EGU General Assembly Conference Abstracts (Vol. 16, p. 17028).
21. IPCC (2013) Summary for Policymakers. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, Table SPM 1, p.7.
22. IPCC (2013) Summary for Policymakers. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. P.4.
23. Blake J (1999) Overcoming the 'value-action gap' in environmental policy: Tensions between national policy and local experience. *Local environment* 4: p.257.
24. Smith Joel B, Dennis A. Tirpak (1989) The potential effects of global climate change on the United States. Vol. 1. Office of Policy, Planning and Evaluation, US Environmental Protection Agency.
25. Lutsey, Nicholas, Daniel Sperling (2008) "America's bottom-up climate change mitigation policy." *Energy Policy* 36.2 : 673-685.
26. For a thorough examination of this dram, see Pooley, Eric. "The climate war." True Believers, Power Brokers, and the Fight to Save the Earth (2010).
27. Republicans like Senator Jim Inhofe (Oklahoma) remained steadfast against anything that looked like climate change because he denied the basic science behind the issue. More moderate Republicans like John McCain (Arizona) eventually accepted the findings. In general, though, Republicans have been largely against climate change policy.
28. IPCC. P.8.
29. A Louisiana Tribe Is Now Officially A Community Of Climate Refugees. Available at http://www.huffingtonpost.com/entry/climate-refugees-louisiana_us_56bbd5efe4b0c3c550501784.
30. National Climate Assessment. Available at <http://nca2014.globalchange.gov/>.
31. National Research Council. Climate Change: Evidence, Impacts and Choices. Available at http://nas-sites.org/americasclimatechoices/files/2012/06/19014_cvtx_R1.pdf. P.28.
32. IPCC. P.25.
33. Fox-Penner P (2014) Smart Power Anniversary Edition: Climate Change, the Smart Grid, and the Future of Electric Utilities. Island Press.
34. Battaglini A, Lilliestam J, Haas A, Patt A (2009) Development of SuperSmart Grids for a more efficient utilization of electricity from renewable sources. *Journal of cleaner production* 17: 911-918.
35. National Climate Assessment. Mitigation Message 1.
36. Murray V, Ebi KL (2012) IPCC Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX). *J Epidemiol Community Health* 66: 759-760. [[crossref](#)]
37. Id.
38. IPCC. P.9
39. Kasemir B, Dahinden U, Swartling ÅG, Schüle R, Tabara D, et al. (2000) Citizens' perspectives on climate change and energy use. *Global Environmental Change* 10: 169-184.
40. Harvey M, Pilgrim S (2011) The new competition for land: food, energy, and climate change. *Food Policy* 36: S40-S51.
41. Pacala S, Socolow R (2004) Stabilization wedges: solving the climate problem for the next 50 years with current technologies. *Science* 305: 968-972.
42. Stern N (2006) Stern review: The economics of climate change, executive summary. Available at <http://webarchive.nationalarchives.gov.uk/20130129110402/> and Executive Summary Available at http://www.hm-treasury.gov.uk/d/Executive_Summary.pdf.
43. Pearce DW, Turner RK (1990) Economics of natural resources and the environment. JHU Press. P.241.
44. Nordhaus WD (2007) A review of the "Stern review on the economics of climate change". *Journal of economic literature*, 686-702. P.690. Nordhaus jabbed Stern personally in both his paper and presentation. He brought up the incorrect assessment of Iraq's WMD program as proof that Britain (and the US) is not infallible.
45. Koopmans TC (1965) On the concept of optimal economic growth. P.16
46. Lattanzio Richard (2015) The Global Climate Change Initiative: Budget Authority and Request. CRS Report. February 6.
47. Leggett Jane (2015) Climate Change Adaption by Federal Agencies. CRS Report. February 23.
48. Knutti R, Sedláček J (2013) Robustness and uncertainties in the new CMIP5 climate model projections. *Nature Climate Change* 3: 369-373.
49. Corner A, Whitmarsh L, Xenias D (2012) Uncertainty, skepticism and attitudes towards climate change: biased assimilation and attitude polarization. *Climatic change* 114: 463-478.
50. Potoski M, Woods ND (2002) Dimensions of state environmental policies. *Policy Studies Journal* 30: 208-226.

51. Victor DG, House JC, Joy S (2005) Climate. A Madisonian approach to climate policy. *Science* 309: 1820-1821. [crossref]
52. Lester JP (1995) Federalism and state environmental policy. *Environmental politics and policy: Theories and evidence*, 39-60. Pp.39-40.
53. Glaser PS, McGuffey III CW, Gaines HW (2014) EPA's Section 111 (d) Carbon Rule: What if States Just Said No? Federalist Society White Paper. Nov, 6.
54. Regional Greenhouse Gas Initiative. Available at http://www.rggi.org/docs/mou_12_20_05.pdf.
55. Byrne, John, et al. "American policy conflict in the greenhouse: Divergent trends in federal, regional, state, and local green energy and climate change policy." *Energy Policy* 35.9 (2007): 4555-4573.
56. Lutsey.
57. Kneese, Allen V, Charles L. Schultze (1975) "Pollution, prices, and public policy: a study sponsored jointly by Resources for the Future, Inc. and the Brookings Institution."
58. Hooghe, Liesbet, Michael Keating (1994) "The politics of European Union regional policy." *Journal of European Public Policy* 1.3: 367-393.
59. Australian Public Service Commission (2012) "Tackling wicked problems: A public policy perspective."
60. Cooke Philip (2001) "From technopoles to regional innovation systems: the evolution of localised technology development policy." *Canadian Journal of Regional Science* 24.1: 21-40.
61. Milliman, Scott R, Raymond Prince (1989) "Firm incentives to promote technological change in pollution control." *Journal of Environmental economics and Management* 17.3: 247-265.
62. Krause, Rachel M (2011) "Policy innovation, intergovernmental relations, and the adoption of climate protection initiatives by US cities." *Journal of urban affairs* 33.1: 45-60.
63. Delta Regional Authority. Available at <http://dra.gov/>.
64. 102 Statute 2229.
65. 102 Statute 2246. Established the mission and identified the counties (and parishes) to be part of the Commission.
66. Alabama would be added in 2000.
67. Linking the Delta Region with the Nation and the World: [an Update by the Federal Highway Administration on Progress Achieved in Transportation and Employment in the Lower Mississippi Delta Region]. [Washington, D.C.]: Lanham, MD: U.S. Dept. of Transportation, Federal Highway Administration; FHWA Research and Technology Report Center [distributor], 1995.
68. These included HUD, USDA, Labor, Education and the EPA.
69. 7 USC Chapter 50, Subchapter VI: Delta Regional Authority; § Sections 2009aa1.(a-j).
70. Id. § 2009aa4.(c)(2).
71. Bianchi, Thomas S., Mead A. Allison (2009) "Large-river delta-front estuaries as natural "recorders" of global environmental change." *Proceedings of the National Academy of Sciences* 106.20: 8085-8092.
72. Blum, Michael D., Harry H. Roberts (2009) "Drowning of the Mississippi Delta due to insufficient sediment supply and global sea-level rise." *Nature Geoscience* 2.7: 488-491.
73. Day JW Jr, Boesch DF, Clairain EJ, Kemp GP, Laska SB, et al. (2007) Restoration of the Mississippi Delta: lessons from Hurricanes Katrina and Rita. *Science* 315: 1679-1684. [crossref]
74. Erwin, Kevin L (2009) "Wetlands and global climate change: the role of wetland restoration in a changing world." *Wetlands Ecology and management* 17.1: 71-84.
75. Davis, Steven J, Ken Caldeira, H. Damon Matthews (2010) "Future CO2 emissions and climate change from existing energy infrastructure." *Science* 329.5997: 1330-1333.
76. Hoffert MI (2010) Climate change. Farewell to fossil fuels? *Science* 329: 1292-1294. [crossref]
77. Demuzere, Matthias, et al. (2014) "Mitigating and adapting to climate change: Multi-functional and multi-scale assessment of green urban infrastructure." *Journal of environmental management* 146: 107-115.
78. Wilbanks, Thomas J., Steven Fernandez (2014) *Climate Change and Infrastructure, Urban Systems, and Vulnerabilities: Technical Report for the US Department of Energy in Support of the National Climate Assessment*. Island Press.
79. Intergovernmental Panel on Climate Change. *Climate change 2014: mitigation of climate change*. Vol. 3. Cambridge University Press, 2015.
80. Jardine, Angela, et al. (2013) *Assessment of climate change in the southwest United States: a report prepared for the National Climate Assessment*. Island press.
81. Bierbaum, Rosina, et al. (2013) "A comprehensive review of climate adaptation in the United States: more than before, but less than needed." *Mitigation and adaptation strategies for global change* 18.3: 361-406.
82. McMichael AJ (2013) Globalization, climate change, and human health. *N Engl J Med* 368: 1335-1343. [crossref]
83. Woodward A, Smith KR, Campbell-Lendrum D, Chadee DD, Honda Y, et al. (2014) Climate change and health: on the latest IPCC report. *Lancet* 383: 1185-1189. [crossref]
84. McMichael, Anthony J, Elisabeth Lindgren (2011) "Climate change: present and future risks to health, and necessary responses." *Journal of internal medicine* 270.5: 401-413.
85. Cheng, June J., Peter Berry (2013) "Health co-benefits and risks of public health adaptation strategies to climate change: a review of current literature." *International journal of public health* 58.2: 305-311.
86. Patz JA, Frumkin H, Holloway T, Vimont DJ, Haines A (2014) Climate change: challenges and opportunities for global health. *JAMA* 312: 1565-1580. [crossref]
87. Haines A, McMichael AJ, Smith KR, Roberts I, Woodcock J, et al. (2009) Public health benefits of strategies to reduce greenhouse-gas emissions: overview and implications for policy makers. *Lancet* 374: 2104-2114. [crossref]