Social Solutions for Climate Change Mitigation and Adaptation: Cross Cultural Lessons from Denmark to the United States[1]

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With increased coastal flooding, severe storms, biodiversity loss and environmental degradation, concerns over anthropogenic climate change have truly risen to the forefront of our collective global consciousness. In response, the international community has begun to formulate comprehensive climate change legislation. Failing to recognize the root of the problem, however, most environmental policies, industry regulations and international protocols have fallen short of achieving their stated goals. The struggle to implement and enforce effective climate change legislation is compounded by conflicting public opinion, a long history of energy dependency, notions of progress tied to technology, and cultural values. Solutions to climate change mitigation and adaptation require a major shift in prevailing social attitudes regarding our relationship to fossil fuels, and must therefore focus efforts on encouraging individuals to change their behavior and values. Policymakers must in turn recognize the role of social capital, individual responsibility, and public participation. A critical and interdisciplinary examination of two case studies with stark contrasts in government legislation and social action serves to illuminate the factors that directly influence the efficacy of mitigation and adaptation efforts.

The first, Denmark, represents a highly successful intersection of policies and social actions on climate change mitigation and adaptation, with Copenhagen leading this progress. Through the city's public transportation system, bicycle program, and alternative energy sector, Copenhagen balances the lofty goals of government regulation with achievable local action. On the other hand, the United States represents many of the challenges to implementing effective climate change mitigation and adaptation. Seattle, Washington stands out as a

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considerable leader in sustainability, but pales in comparison to its European counterpart. Known for its lush green forests, the Emerald City recently committed itself to becoming North America's first "climate neutral" city by 2030—a goal fraught with considerable obstacles unique to the U.S. Though Denmark and the United States are comparable in many regards, Denmark outpaces the U.S. as a global leader in climate policy. Social solutions to climate change mitigation and adaptation in these two nations remain uneven because of one major discrepancy: in Denmark sustainability is the rule, while it is only an exception in the United States.

Though difficult to isolate the complex historical, cultural, economic and political variables that distinguish one country from the other, Danish energy policy has certainly emerged out of the unique juxtaposition of all of these factors. This is especially interesting considering the frequent disregard for cultural variables in the evaluation of challenges to and implications of climate policy. While many legislators are critical of initiatives that attempt to employ theories of social science in the implementation of solutions to climate change, the struggle to meet international goals for reducing emissions depends on comprehensive, holistic strategies, and not just on new technologies.

In comparing Copenhagen and Seattle as microcosms of the larger societies they represent, this paper illuminates the increasingly navigable pathways towards sustainability through *integrative* social solutions to climate change mitigation and adaptation. Denmark and the United States are particularly relevant case studies because they represent two extremes along a continuous spectrum: the former being extraordinarily eco-conscious and the latter bogged down by ideological debates. This research will first explore national and international policy failures, and then look at theory to inform our understanding of regional policy before critically examining these two case studies.

A brief introduction to each setting seems appropriate to contextualize their most basic contrasts and parallels. Denmark, a nation in northern Europe, is smaller than the state of Massachusetts with an area of only 43,094 square kilometers, and a population of 5,539,888 (U.S. Central Intelligence Agency, 2011). Yet 87 percent of this population is urban, living in dense concentrations in greater Copenhagen and Odense. Danes enjoy one of the highest standards of living in the world, mediated by relatively high GDP per capita ($36,700) and an extensive welfare system (CIA, 2011). The nation consumes 34.3 billion kilowatt hours of electricity each year, but receives a considerable proportion of this—some 18.9%—from renewable resources such as wind (Danish Energy Agency, 2011). Copenhagen, located on the east coast of the islands of Amager and Zealand west of Sweden, has a population of 1.2 million (CIA, 2011). The city was founded around the 11th century, and has since grown into a major metropolis. Copenhagen is well known for its public bike program

and bicycle culture, a recently constructed city metro system, and for significant public and private investments in domestic wind power.

The United States is far larger than this Scandinavian state. At 9,826,675 square kilometers, America is the third largest country in the world, and the third most populated at 313,232,044 people (CIA, 2011). Surprisingly, 82 percent of this population is urban, enjoying a per capita GDP of $47,400. A technologically dependent nation, the United States consumes 3.873 trillion kWh of electricity (CIA, 2011). Seattle, Washington, in the Pacific Northwest, has only 608,660 residents—slightly more than half the population of Copenhagen. Notable for its green architecture and a groundbreaking commitment to carbon neutrality, Seattle is often ranked quite high among comparable U.S. cities for standard of living. Unfortunately Seattle is one of the most heavily congested cities in the United States, and its struggle to mitigate climate change stems from a century of heavy reliance on the automobile. It is for this reason that Seattle climate policy diverges from that of Copenhagen.

Defining Mitigation and Adaptation

Before delving into deeper distinctions between these case studies, I will attempt to define *social solutions* for climate change mitigation and adaptation. To do so is to distinguish ultimately between a dominant framework of thought and one that seems tertiary or peripheral. Discourse on climate change has often framed the causes and consequences of warming temperatures, droughts, coastal flooding, and biodiversity loss as a *scientific* phenomenon. Iconic representations of climate change such as the Keeling Curve have had a great impact, but they do not convey comprehensive, qualitative data, and subsequently distract us from recognizing behavior as ultimate cause. Scientific evidence is necessary to ignite political will, but not sufficient to catalyze social change. International authorities and institutions are ill equipped to alleviate the anthropogenic roots of climate change, and existing models of legislation are unfit to regulate at such scale.

The struggle to characterize *social solutions* for mitigation and adaptation consequently stems directly from this tension: policymakers are wary of recognizing climate change as a social phenomenon because traditional policy mechanisms are incapable of impacting social behavior beyond the shallowest of levels. Regulations may set caps on industrial greenhouse gas emissions, enforce strict vehicle fuel efficiency standards, and impose taxes on carbon-intensive fuels, but they cannot fully mobilize a society to take action in a productive way.

Defining social solutions to climate change mitigation and adaptation is not impossible, but it would challenge the very structures that have catalyzed global environmental change. Fundamental to such a definition is the distinction between mitigation versus adaptation. While these terms are essential to discourse on climate change, they are rarely articulated explicitly. There are many unequivocal interpretations of both concepts,

and nearly every one references their interdependence, combined value, or challenges. Mitigation and adaptation connote both proactivity and passivity in that efforts to achieve these goals depend upon the intersection of immediate effects and future consequences, shifting baselines of environmental quality standards, and considerable scientific uncertainty. According to popular theory, the two are very much separate entities (Mastrandrea & Schneider, 2010). A typical narrative of this theory is as follows: Western, developed nations must mitigate climate change so that the developing world, which already bears a disproportionate burden due to higher vulnerability, does not have to adapt to climate change. Though adaptation must indeed occur when mitigation "fails," the two are mutually reliant because climate change affects our planet quite indiscriminately, requiring us all to act. Nations that must make greater considerations for adaptation are usually those without the insulating layers of infrastructure and technology, ecosystem services beyond local resource constraints (imported goods), or a philanthropic safety net (Myers, 2009). To avoid hasty generalizations, though, these insulating layers do not of course always serve to decrease vulnerability to climate change. Hurricane Katrina, a category 3 storm that hit the U.S. Gulf Coast in 2005, is one such example: despite federal emergency aid resources and an extensive system of levees, the devastation to infrastructure, ecosystem, and human life was great.

As such, we should understand that *mitigation* encompasses the proactive modification of current behavior to slow or reduce future environmental degradation related to climate change. This concept assumes that large-scale reductions in present greenhouse gas emissions would tangibly alter our collective march towards disastrous consequences, a claim with significant evidentiary support (Mastrandrea & Schneider, 2010). Complete inaction will irrefutably result in greater adverse consequences. Mitigation essentially encourages a transition away from fossil fuels toward sustainable, renewable alternatives combined with efforts to maintain valuable ecosystem features. These combined actions would decrease the concentration of greenhouse gasses by eliminating their sources and increasing their sinks (Carter & Culp, 2010). Specific mitigation initiatives might include reforestation, fuel efficiency standards for automobiles, and a reinvigorated nuclear power industry, all of which require widespread social support to be sustainable.

Adaptation, on the other hand, involves the combination of local and global responses to inevitable climate change, from infrastructure modification and crop engineering to international aid. Populations displaced by flooding or drought face insurmountable challenges such as increased vulnerability to adverse health outcomes, resource conflicts, and general abandonment of traditional means of survival. Adaptation is perhaps regarded as secondary to mitigation, because it is undesirable to shift our behavior and way of life to accommodate or tolerate potential consequences we cannot yet predict or ascertain. As mentioned earlier,

there are major discrepancies in adaptive capacity between developing nations, such as Bangladesh, and developed countries, such as Denmark and the United States (Myers, 2009).

Still, the ambiguity of these respective terms characterizes the very complexity of their intent. We are unable to define mitigation and adaptation strictly because we cannot predict their efficacy in preventing or slowing climate change, yet we separate them because they supposedly hold unequal potential as policy mechanisms. The proliferation of these terms into mainstream social and political commentary implies at least the recognition that solutions to climate change are twofold. Regardless of misinterpretations on the distinction between mitigation and adaptation, these concepts accurately represent pervasive social attitudes and values.

Social Theory Should Inform Policy

Several theories from political science, sociology and anthropology may serve to inform our understanding of the phenomenon of social solutions to climate change mitigation and adaptation. While it may seem to naturally align with *environmental activism*, my use of *social solutions* is quite unique. Adaptive capacity, one of the greatest determinants of policy efficacy, is increasingly defined as highly dependent upon the potential for collective action (Lubell, Zahran & Vedlitz, 2007). The collective interest model consequently serves to characterize such social solutions. This theory asserts that people will participate in a collective endeavor when the expected value of participation is greater than the expected value of non-participation. People judge the expected value of participation by assessing the total value of the public good, the probability of their participation affecting collective outcomes, and the selective benefits and costs of participation (Lubell et al., 2007). The collective interest model applies particularly well in the face of scientific uncertainty, massive populations affected by climate change, and relatively weak institutions. Collective action depends on five factors: the perceived value of the collective good produced by successful environmental action, the increase in the probability of success if the individual participates, the extent to which the actions of the group as a whole are likely to be successful, the selective costs of participation, and the selective benefits of participation (Lubell et al., 2007). The collective interest model is traditionally used to analyze mass political action in the form of political protest, but its applications for addressing climate change through social action have recently become abundantly clear. In the relationship between collective interest and action, social capital replaces economic as societies collectively express environmental values and expectations. For the purpose of this paper, social capital is synonymous with resilience: in order to cope with or adapt to climate stress, communities must value social cohesion (Adger, 2003). Connectedness to one's community directly encourages stronger collective action.

Translation of the collective interest model in this context may explain contrasts in the proliferation of social solutions to climate change between Denmark and the United States. If sustainability is a rule, individuals are inherently more likely to engage in sustainable activities. If it is only an exception, individuals may feel discouraged from deviating from the norm, risking economic cost or social status to adopt sustainable practices without guaranteed benefit. Take, for example, bicycle culture in Copenhagen. Though Denmark and the United States likely face a similar burden of climate change, Danes have collectively, though somewhat unwittingly, adopted the bicycle as a means of mitigation, demonstrating a significantly greater collective interest in protecting Danish culture, the natural environment, and future resource security. Often the transition from automobility to bicycling requires modest lifestyle changes and infrastructure development, but these costs pose a greater benefit to society than inaction. Subsequently, the proliferation of bicycle culture as mediated by collective interest reinforces perceptions of individual action efficacy. Especially in compact cities, Danes are more willing to mitigate climate change in this manner because they are internally propelled to maintain social connectedness, and encouraged by identifying with a greater social cause.

Integrative mitigation and adaptation efforts depend on a measurement of resources not typically considered in traditional policymaking. *Social capital* represents perhaps the greatest divergence between integrative climate policy and top-down models of legislation: it is a qualitative manifestation of complex social networks with tangible consequences. While financial capital measures the availability of wealth to achieve specified aims, social capital measures the strength of community interactions. In developing and developed nations alike, financial capital is all too often the only measure of productivity, agency, and even political will. But the richest nation in the world is, in theory, as vulnerable to climate change as the poorest nation. In contrast, social capital establishes resilience as a product of trust, reciprocity, and collaboration—not gross domestic product. The efficacy of adaptation and mitigation efforts is determined by the "interdependence of agents through their relationships with each other, with the institutions in which they reside, and with the resource base on which they depend" (Adger, 2003). Though social capital is easily distinguished from financial or physical capital, policymakers and academics struggle to understand this variable beyond its theoretical basis. Yet social capital has immense implications for adaptive capacity and its applications in the real world: highly interconnected communities that maintain a strong relationship with institutions of power are able to traverse boundaries between "top-down" and "bottom-up." Social capital facilitates an effortless interaction between these two forms of political action, challenging the static, ineffectual nature of the traditional legislative process in attempting to reconcile deep, systematic flaws.

Similarly, many theorists on the collective interest model posit that climate change policy is inherently incongruous with the structure of most governments, particularly those in nations with the greatest impact on the environment. This flaw defines the challenges to mitigation and adaptation through traditional strategies of legislation and regulation: "Adaptation processes involve the interdependence of agents through their relationships with each other, with the institutions in which they reside, and with the resource base on which they depend" (Adger, 2003). Proponents of some economic and political science models have argued that institutions are merely an outcome of individual exchange and of the state's provision of frameworks to provide stability for these exchanges (Adger, 2003). If connectedness (read: social capital) apparently flourishes between and within social groups naturally, and if government exists to facilitate such interactions, then climate policy must recognize and mobilize the collective interest in order to enact change. Likewise, if regulatory policy derives from a representation of the people's actual interests, then greater efforts should be made to ensure full compliance with social values.

Yet the implementation of integrative climate policy through social participation may only be appropriate for a limited number of initiatives. Collective action alone will not implement a carbon tax or cap-and-trade program, nor can it fund research and development on renewable energy technologies. These types of actions target large-scale change and seek to mobilize entire industries or nations rather than communities. Though these initiatives are certainly not beyond the influence of social values, they are not as direct a manifestation as others. Social participation determines the success of both community-organized and government-mandated mitigation and adaptation efforts. Social participation may involve engagement with a number of policies, initiatives, or technologies; for example, bicycle culture, use of mass transit, buying local or organic food, and installing solar or wind power at home.

Environmental consciousness relates directly to the efficacy of social action strategies of climate change mitigation and adaptation. Though individuals consciously interact with their environment through resource extraction, infrastructure development, and commercial agriculture, these actions rarely induce self-awareness to the impacts and consequences of their actions. A community's level of environmental consciousness could be regarded as a definitive condition for effective collective or individual action. Whether this mindset grows organically or in response to crisis, it is necessary for the implementation and success of climate policy or action.

To examine the factors that have historically encouraged or discouraged *social solutions* to mitigation and adaptation in Denmark and the United States, the concept of environmental consciousness plays a major role. However, natural and human-induced catastrophes occur far too frequently to suppose that all of them contribute equally to increased

environmental consciousness and social action. Furthermore, events not related to weather or climate also affect environmental consciousness. The 2003 European heat wave, 2004 Indonesian tsunami, Hurricane Katrina in 2005 and the Japanese earthquake in 2011 have all weighed heavily on our perceptions of risk, but so have the 1973 Arab Oil Embargo, the Iraq War, and the 2011 Gulf Oil Spill. Environmental consciousness is informed by a multitude of intersecting and independent factors, of which the global news media ensures that we are constantly aware. How then do we internalize and interpret these crises in a productive way, and how can technology—such as social media—mediate this process? Can a lack of collective environmental consciousness, as in the United States, be overcome to achieve strides in effective climate policy? While it is difficult to navigate these questions, it is important that we recognize them as tangible, defining characteristics for domestic policy.

The definition of social solutions to climate change mitigation and adaptation consequently derives from a complex set of experiences, perceptions, and reactions. While the collective interest model serves to elucidate the importance of these factors as they relate to climate change, this theory may be extended to make another critical distinction, but one that is perhaps more simple. Notions of progress have profound implications for our relationships to energy, natural resources, and the myriad of activities that depend upon them. A brief digression should serve to contextualize this: in each case study there is at least one mainstream ideology that contributes to a collective responsiveness to climate change. In Denmark, this is *Hygge culture*, while in the United States it is the *American Dream*. These phenomena begin to mark an important delineation between the two nations.

Danish Hygge culture is defined as a sense of *coziness*, though it probably loses something in translation. Public and private spaces alike strive to achieve this quality by eliminating the burdens of obligation and a fast-paced lifestyle. Hygge, a state of physical and mental tranquility, encourages Danes to value meaningful social interaction with family and friends. This phenomenon characterizes Danish standards of living quite well: less is often more. Hygge consequently implies greater social cohesion or social capital, thereby increasing the country's resilience to climate change and adaptive capacity. While it may be a bit of a stretch, Hygge is essential to Danish identity.

In a stark contrast, the American Dream represents everything that Hygge culture is not. Since the mid-twentieth century, Americans have strictly defined prosperity and success by adherence to this concept. Characterized by employment and home ownership, the American Dream frequently connotes the idyllic image of a happy family and a white picket fence. Yet the same attitude encourages mass consumerism: with great wealth comes a large house, powerful automobiles, and the latest in personal electronics. The pursuit of excess, which defines American progress by the quantity of material goods, has considerable impacts on

resource demand. This quest for upward mobility presents a unique challenge to policymakers seeking to effect meaningful social change, especially regarding the role of technology in advancing rather than necessitating mitigation and adaptation efforts.

To subvert this conventional American thinking requires a major paradigm shift in discourse on climate change. In his much-celebrated work, *The Structure of Scientific Revolutions*, Thomas Kuhn posited that distinct paradigms cannot overlap: they are fundamentally and conceptually incompatible (1962). Translating Kuhn's theory into contemporary application, this incommensurability hinders social action strategies for climate change mitigation and adaptation, because we have yet to overcome the traditional mechanisms of political action. We must recognize the failures of past regulation and legislation; understand the historical patterns and processes that led to the divergence from a sense of environmental consciousness; subvert the role of scientific uncertainty in motivating proactivity; and mobilize social capital for the service of policy. Sustainability is not contradictory to the American Dream, nor is it innate to Hygge culture. The major differences between the two lie, instead, with the mediation of historical factors. While it is difficult to isolate and interpret each, we must do so to justify collective action as a mechanism for meaningful change, and to encourage individual behavioral modification in the United States and in Denmark.

From Theory to Application

While the compendium of theories discussed in the last section is perhaps overwhelming, each one serves to lay the groundwork for a thoroughly nuanced understanding of this paper's case studies, which will be presented in full after one final contextualizing thought. Leading climate change theorist Dr. Emma Tompkins articulates a set of benchmarks that translate these seemingly unconnected ideas from theory to application. Her comprehensive evaluation criteria include awareness, agency, leadership, agents of change, working together, learning, managing operations, program scope, coherence, and expertise (Tompkins, 2010). The length of this list is appropriately proportional to the challenges climate policy must overcome. Each community has distinct values and behaviors, as well as distinct vulnerabilities, to climate change. Unlike the monocultural Denmark, most nation states are far from homogenous, and policies must consequently focus on the local level to enact change. Community engagement is therefore crucial to shaping policy and ensuring participation by all groups. These benchmarks bring up an important set of critical questions, such as who is already adapting and by what means? How can we evaluate the success of adaptation? What tradeoffs are necessary for effective adaptation? And how can we scale down the policies of a centralized government to a local scale? To answer these questions we must look to the two case studies, where local communities and national governments are adapting to overcome new

challenges. The integration of social-action-based policy initiatives is becoming more and more common, and will continue to be the model for mitigation and adaptation.

However, one cannot simply assert that this model is without faults or controversy. Tompkins argues that a shift towards individual responsibility may have "dangerous outcomes" (2010). Though neglecting to qualify this assertion, she seems to imply that individual responsibility is actually detrimental to the efficacy of mitigation and adaptation policy. There is an important distinction to make then between inconsistent or nonexistent policies that consequently necessitate individual action, and those that intentionally and productively support it. When a community is neither directly encouraged to engage in environmentally responsible behavior nor structurally mobilized to do so, individual action may serve a minor role, but it is certainly not enough. Expecting such populations to achieve effective mitigation or adaptation is both naïve and futile. Though Tompkins suggests that mitigation and adaptation efforts require some extent of organizational change to enhance the integration of large-scale government with local concerns, she fails to recognize the relationship between public involvement and individual responsibility as codependent variables. This argument marks a notable disjuncture between climate policy in theory, and climate policy in action. By glossing over the very mechanism of change—individual participation in policy—Tompkins, a well-known figure in her field, unwittingly proves that mitigation and adaptation strategies require a set of methods wholly unique to the issue of climate change. Policymakers can no longer simply translate the same old legislative model to fit a new problem, but must create a fundamentally different framework of theory, practice, and evaluation.

A paradigm shift of this extent can only occur in environments where the impacts of public participation in mitigation and adaptation efforts are fully realized. The fact that Copenhagen and Seattle are both cities is no coincidence for the purpose of this paper: dense population centers represent the apex of environmentally irresponsible behavior, but also perhaps the best geographic and social context in which to enact change. The city is a particularly appropriate arena in which to address climate change for two related reasons. First, cities are sites of high energy consumption and waste production. Second, it is in cities that authorities can facilitate the greatest response to climate change, either by lobbying national governments or by developing local projects to demonstrate the large-scale costs and benefits of greenhouse gas emission reduction strategies (Bulkeley & Betsill, 2003). Furthermore, cities typically have strong local media and other civic institutions that can carry a targeted message to the community. There is also evidence that individuals emulate the best practices of their neighbors, and this behavior is more likely in dense cities where face-to-face contact in maximized.

Arguably, we already regard the city as a progressive space for experimental development. In the nineteenth century, urban policy goals

focused on making cities safe and healthy places to live, whereas twenty-first century goals seek to make cities more self-regulating, self-sufficient and adaptive (Romolini, 2011). Yet the transition from a "sanitary city" to a "sustainable city" is not an easy one. A key principle of this trend includes the shift from technical or regulatory to polycentric or mixed governance (Romolini, 2011). This shift necessitates a diffusion of government and its authority to individuals and non-governmental or nonprofit organizations. While such an evolution is radical, it is crucial for producing effective urban climate policy. In the sustainable city, a multitude of opinions must be vocalized and heard. Urban sustainable development is dependent upon local action that challenges the distinction between top-down and bottom-up policies. Consequently, the ideal city government should possess several important characteristics, including committed individuals with institutional support for promoting climate protection; funding specifically allocated to mitigation and adaptation efforts; local agency; a locally-framed discourse on climate change; and a political will to act (Romolini, 2011). The following examination of these factors should ultimately reveal the basis for the difference in national climate policy between Denmark and the United States, and for the similarity in local action between Copenhagen and Seattle, thereby illuminating the most effective paths to reaching a sustainable city.

Lessons from Copenhagen, Denmark

Copenhagen, Denmark is a city that exemplifies Scandinavian ideals: it commands world attention as a model of sustainability and modernity, but does so quite effortlessly. Historically, political and technological progress in Copenhagen has mirrored that of most countries within Europe. Within the last century, though, the tiny nation has propelled itself to greatness, making immense strides in climate change mitigation and adaptation efforts. The most notable of these include bicycling, light rail, and wind power.

The City Bike program is perhaps the most exemplary of national and regional commitments to sustainability, adaptation, and mitigation. Though the program benefits tourists more than Danes, it is largely regarded as a beacon of sustainable achievement for the international community. The program began in the late 1980s to early 1990s, when a group of Danes sought to prevent bike thefts by increasing public access (Bjerrum, 2011). Initially, bike racks were placed in central locations near bus and train stops to provide transportation after public transportation ceased at night. Though the initiative proved successful with 1,000 bikes in total, the program's venerable director passed away in 1999 and the program lost significant momentum (Bjerrum, 2011). Soon thereafter, a Danish nonprofit organization acquired responsibility for the meager bike project. Incita, a social-welfare company that trains hundreds of unemployed and disabled individuals for job placement, rapidly developed

the project into the highly effective, city-wide transportation system it is today.

The bicycle program, which exemplifies the Danish social-welfare model, is not without flaws. Incita provides both educational services and sustainable transportation for a large percentage of the population. Surplus profits go toward purchasing additional bikes to provide for a greater population, but the demand for regular upgrades to the existing stock is costly. So in attempting to eliminate the need for personal automobiles in Copenhagen, the City Bike Program must provide an alternative that is both technologically appropriate and aesthetically pleasing. Further compounding this challenge, the entire bike program is faced with the unpredictability of extreme weather. Despite these difficulties, the program has expanded its season from six months to nearly nine, now running from March through November. In 2009 the program continued well into December to accommodate COP15.

The bikes themselves have quite a story to tell: they release into new hands at the insertion of a 20 kroner coin (about $4 US) in the bike lock. The first stainless steel bicycles cost 2200kr, depending on color. Since releasing the first model, Incita has adopted 30 different versions, the most recent featuring a significantly lighter frame at a slightly steeper cost of 2700kr (Bjerrum, 2011). These constant innovations ensure the future of City Bike as a desirable, sustainable transportation option for Copenhagen residents and visitors alike. All bikes come equipped with a small map of the central city zone, which highlights sites of interest. Use of the bicycles is limited to this zone, and Incita has experienced few violations of this rule.

Most of the challenges faced by the City Bike program stem from flaws in Copenhagen bicycle culture. As one of the more recognizable organizations responsible for bicycling in the city, the program is often blamed for problems far beyond its control. An extremely high number of bicyclists necessitate a proportionate availability of bike parking, but few individuals take advantage of the underground parking facilities at metro stations, which offer security, protection from the elements, and free bike pumps. Consequently, overcrowding at above-ground racks, such as the one at Nørreport station, is common. Further complaints involve aesthetic and structural damage to private homes and businesses when bicyclists lean their bikes against walls. Some bicyclists similarly provoke irritation by disregarding established traffic rules. Those who run red lights and drive on pedestrian streets only prove that there is no “high culture” of bicycling. The City Bike program is constantly flooded with complaints, which the nonprofit shrugs off as an acceptable imperfection. Thanks to Danish policy regarding civil action suits, Incita has never been sued or held accountable for liability regarding the safety of its bikes; if you participate in Copenhagen bicycle culture on a City Bike, you assume the risks but also reap all the rewards.

The City Bike Program, and bicycling culture in general, has benefited from a legacy of strong institutional and social support. Since the 1960s, a number of influential and visionary politicians have invested in infrastructure to drive Copenhagen development towards a more sustainable future. An old, dense city with little room for growth, Copenhagen faced a unique set of challenges upon entering the modern, technological age. Rapid urbanization during the middle of the twentieth century led to increased development in the suburbs, and a centralized public transportation system became necessary. But delays in the construction of a central, underground metro system until 1997 allowed bicycling to expand over the last half century into the single most efficient means of transportation in the city (Aakilde, 2011). Following suit, the Copenhagen Metro system is one of the most efficient and sustainable in the world. The Metro required environmental impact assessments at regular intervals throughout construction and operation to measure waste disposal as well as electricity and water consumption. To decrease these impacts, metro stations were constructed at shallow depths below ground, and mirrored skylights were installed to allow for natural light to illuminate stations as far as 40 meters down (Aakilde, 2011). The system uses fully automated, high-speed electric trains, thereby reducing energy intensity and total operating costs. Though carbon still accounts for 60 percent of domestic electricity production, the Metro system relies solely on Danish wind power (Aakilde, 2011). Surprisingly, there is no competition between train and bicycle, but a seamless and elegant integration. With the exception of rush hour, commuters are permitted to bring their bicycle on the train, thereby expanding bicycle use far beyond the central zone.

A long history of such progressive institutional commitment has resulted in a strong political link between environmental and economic concerns. Consequently, many individuals struggle to differentiate between the two, and participate in national sustainability efforts because of economic incentive alone (Fog Olwig, 2011). This phenomenon began with the 1973 Arab Oil Embargo, which challenged national energy security and forced Denmark to reevaluate its energy consumption patterns. The country immediately began to invest significantly in research and development of alternative energy and sustainable infrastructure, a decision much lauded by the general population. By 2008, 18.9 percent of Danish electricity production came from wind power, with the majority of wind sites off shore (Klaus, 2011). Vestas and Siemens are just two domestic companies that manufacture wind turbines, contributing to Denmark's control of at least half the industry. Wind power became integrated into Danish energy policy, because it was a safe, inexpensive alternative to nuclear power and traditional fossil fuels, but also because of direct public participation in wind power development. Beginning in 1996, Danish communities took a vested interest in the development of domestic renewable energy. Individuals who invested in wind turbine cooperatives

or purchased wind turbines received a significant tax exemption. Today these wind co-ops operate over 5,500 turbines, with many more to be installed over the next few years. In 1997, Samsø, a small island in central Denmark, installed a combined 21 wind turbines offshore and on land (Fog Olwig, 2011). The island community has since become a model of carbon neutrality, receiving 100% of its electricity from wind alone. Though Samsø is certainly an extreme example for the application of Danish wind technology, this tiny island reveals the nation's lofty commitment to mitigation and adaptation efforts.

These efforts are strengthened by the subtle integration of environmental and economic concerns in domestic policy. Taxes are effective for the promotion of environmental regulation because of Danes' trust in their national government. Political transparency is a defining characteristic of the Danish parliament: taxes designed to encourage energy efficiency or to cut down on emissions are clearly identified as such. In doing so, parliament is able to enact bold climate policies, which Danes recognize as an immediate economic benefit with long-term ecological impacts. In contrast to the situation in many nations, where public transportation may not present an economically viable alternative to the car, the Danish metro, bus, and rail systems are both affordable and sustainable. The combined commitment to environmental and economic progress is evident in many aspects of Danish society, from organic agricultural regulations to reduced registration fees on hybrid vehicles.

This progressive model of integrative policy has not always been well received, and it has wavered in response to recent political shifts. Both industrialized and agricultural regions have been historically dissatisfied with Danish environmental policy. These voices are gradually influencing current regulations, which are increasingly counterproductive to transportation and energy-intensive farming. Venstre, the center-right liberal party with the current majority, has much deeper agricultural roots than administrations past, and is working to reduce the role of government in individual matters. This marks a considerable shift in political ideology; before 2001, Danish policy was defined by its top-down, cross-sectoral focus on the environment. Connie Hedegaard, current EU climate minister, served as the Danish Minister for the Environment and Minister of Climate and Energy for three years, and led the country forward in reaching its ambitious commitments for reduced energy consumption (Fog Olwig, 2011). Her departure from Danish government in 2010 reinforced a declining determination to achieve this goal. Numerous promising initiatives in Copenhagen have either failed or stagnated (Fog Olwig, 2011). Contrasts between the past period of strong environmental legislation and today's political uncertainty generate negative perceptions within the Danish population of failed leadership and decreased transparency.

Despite these underlying tensions, Denmark is united in support of an ambitious program to support bicycling as a form of environmental

mitigation and adaptation. From infrastructure development to modified consumption patterns, nearly every aspect of urban society advances bicycling accessibility. The bicycle engages such a large percentage of the population that it is celebrated each year with a public speech in Rådhuspladsen central square. This speech, given by one of twelve city legislators dubbed the "Bike Mayor," ushers in the highly anticipated Copenhagen bicycling season (Bjerrum, 2011). Though more symbolic than official in nature, the event is so well attended it receives nearly as much press coverage as a speech given by a member of the Danish royal family.

This integration of top-down policy with bottom-up application and reinterpretation is best evidenced by a groundbreaking Danish initiative called Citizen Driven Environmental Action (CIDEA). With a deep, interdisciplinary understanding of theories on social capital and collective action, CIDEA works with six communities in Denmark to establish and carry out greenhouse gas reduction plans. The initiative's primary methodology is to encourage behavior changes by serving as an interface between citizens and their community, with communication and collaboration integral to this goal (Gaussett, 2011). Those involved in CIDEA include anthropologists, economists, and political scientists. Taking on a slightly passive role, these individuals serve not as the motors of change, but as the fuel to ignite forward momentum. The CIDEA initiative therefore involves integrated top-down and bottom-up efforts to appeal to individual environmental consciousness and overcome structural challenges that encourage noncompliance with existing regulations. Projects take the form of eliminating cars from the commute to school, and educating "climate ambassadors" on home energy consumption. CIDEA relies on generational knowledge transmission to ensure a sustainable future by indirectly educating youth: if school children observe their parents make the switch from automobile to bicycle, this exchange will feel more natural when they are old enough to make their own choices (Bjerrum, 2011). It is truly the strength and receptivity of the connections within these communities that drive a collective desire to succeed—and succeed they do. By facilitating projects that visibly encourage contribution from all members of a community, CIDEA works directly to reverse declining trends in individual environmental responsibility. Individuals are encouraged to reconsider the role they play in influencing collective action. The peer pressure to conform, compounded by government subsidies for sustainable behavior, packs a powerful one-two punch that is unparalleled elsewhere.

Inevitably though, many individuals refuse to participate in bicycle culture, and some completely disregard the policies and taxes that regulate automobile use. Through a tax loophole in Sweden, Volvos and Saabs may be purchased nearly tax-free. According to the director of the City Bike program, 36 percent of the total population is actively engaged for one of four motivations: economic, transportation, exercise, and

environment (Bjerrum, 2011). The latter two motivations are probably far less significant than the first two. Especially among youth and students, bicycles provide a cost-effective, safe form of transportation. Children learn to ride at an early age, and often do so independently long before parents in the U. S. would ever consider it safe. Unlike in the U. S., driving a car is neither a sign of independence nor a rite of passage, and bicycling consequently serves to unify the population. Furthermore, cars do not signify progress in Denmark. In contrast, the bicycle represents personal freedom and decreased dependence on fossil fuels and technology, a mindset that gives greater weight to local agency for sustainable action. Despite participation in Copenhagen bicycle culture by individuals spanning a wide range of socioeconomic statuses, there are certainly generational differences. While all ride bicycles for the same core motivations, younger people more consciously recognize the benefits of bicycle culture for a sustainable future. Perhaps Copenhagen's budding identity as a sustainable city stems from this ideological shift. Though the city has relied on the bicycle for nearly a century, it is only with the rise of environmental consciousness that the world has looked toward Denmark as an example of effective strategies for climate change mitigation and adaptation.

Recently, Copenhagen's City Bike Program extended its reach through an international outreach initiative. Carlsberg Brewery, a cornerstone of Danish history, sponsored a program in New York City with 3,000 free bicycles (Bjerrum, 2011). Despite high anticipation, the project failed because the collective bike system was fraught with too many liabilities to operate under American law. In 2010, Copenhagen City Bikes were featured prominently at the six-month World Expo in China. Denmark's approach to sustainability proved to be quite popular for the event's theme, "Better City, Better Life," and some 70 million visitors turned out to see the bikes. With an ever-increasing international presence, the City Bike program is an influential model for bike share initiatives and urban planning efforts.

This program, in combination with a strong bicycle culture, commitment to wind power, and an integrated metro-rail system demonstrate the efficacy of policies that raise environmental consciousness through economic incentives. These initiatives are internationally recognized because they demonstrate an unparalleled comprehension of the critical relationship between policy and individual actions. Though Copenhagen is not without its flaws, the city represents achievable climate policy through increased communication and interaction at the community level. This case study sets the bar high, but allows us to juxtapose similar efforts in Seattle, Washington through a more nuanced lens.

Lessons from Seattle, U.S.A

Seattle, Washington, is a unique case study for the United States in that the city has a surprisingly distinct local identity that fosters vibrant community action and interaction. Seattleites are proud to live in the Pacific Northwest and recognize that their ecosystem is highly vulnerable to climate change. Concerns regarding the impacts of the forestry industry on local ecosystems in the 1940s, followed by the spotted owl controversy in the early 1990s exemplify the region's historically strong environmental consciousness. But Seattle faces a distinct set of challenges in reaching effective strategies for climate change mitigation and adaptation. While rapidly increasing suburbanization and uncertain energy security in Copenhagen encouraged the city to develop its already sustainable transportation system, Seattle moved toward increased automobility during the same time period. However, recently Seattle has struggled to break from its deeply ingrained dependence on fossil fuels and begun to confront the direct causes and consequences of anthropogenic climate change by means derived straight from Denmark. By engaging an already united community, Seattle proves that social capital indeed has measurable value in mitigating and adapting to climate change. Due to a number of compounding factors, this American city is unlikely to catch up to those in Europe in its sustainability efforts any time soon, especially without stringent national energy taxes to curb irresponsible consumption patterns. Yet its innovative policies and sustainability initiatives diverge considerably from the U.S. norm. The Seattle model should consequently provide vital hope for a nation plagued by insurmountable historical flaws and a deeply divided and ineffective Congress. The United States can overcome its systematic indifference to climate policy, but it will not happen without measured progressive change that fundamentally alters the American social fabric. Seattle is an exception to the rule: it is one of a handful of cities perpetuating forward momentum for the rest of the country.

However, the comparisons drawn between Seattle and Copenhagen must be contextualized within a larger national framework. The United States, a nation of prosperity, opportunity, and over 313 million people (CIA, 2011) lags far behind the rest of the world in comprehensive climate policy, particularly in contrast to smaller European nations like Denmark. The characteristics that perpetuate the inadequacy of climate policy in the United States are the same ones that Seattle must struggle to overcome in its quest to reach carbon neutrality. Massive cultural-economic shifts in the early twentieth century such as Fordism and suburbanization plunged the country into a downward spiral of excessive consumption. The ubiquitous notion of the "American Dream," as discussed earlier, illuminates the influential nature of these shifts on contemporary U.S. society: Americans define both status and modernity by the extent of their consumption. The struggle to enact effective strategies for climate change mitigation and adaptation stems directly from this phenomenon.

Systematic indifference to both national and international sustainability initiatives discouraged U.S. policymakers from signing the Kyoto Protocol, and they have failed to ratify similar pieces of legislation ever since. The failure of international policy to effect tangible change in the United States is compounded by endless debate between Democrats and Republicans in Congress. Large-scale, top-down climate policy has reached an impasse due to deeply conflicting political viewpoints on the role of federal government in regulating industry, the economy, and individual behavior. The United States may be far larger and more powerful than Denmark, but it is small in political environmental consciousness. However, the actions undertaken in cities like Seattle help to bridge the immense gap between nationwide inaction and real sustainable action.

The city of Seattle is dramatically different from the European eco-metropolis of Copenhagen. Located between Puget Sound and Lake Washington in the Pacific Northwest, Seattle is known as the "Emerald City" for its lush evergreen forests. The Duwamish Indian tribe inhabited the region for at least 4,000 years before European settlers founded the city in 1851 (Casey, 2011). Dense forests fostered a profitable timber industry, and the city prospered fairly early in its history. Seattle experienced rapid population growth in the following decades despite repeated hardships—several fires in the late nineteenth century, including the Great Fire of 1899, completely decimated downtown Seattle. But Seattleites rebuilt, "rebounding gracefully" from great tragedy, and unwittingly avoided the effects of a nationwide recession in the process (Casey, 2011). This history defines the city as perhaps one of the most resilient in the United States. Seattle is immune to neither natural disasters nor economic downturn, but it rises to each new challenge with surprising ease. Though climate change poses the same threat to Seattle as to many other cities in the United States, it is this resiliency that gives the city an enormous advantage for adaptation and mitigation.

A far younger city than most on the East coast of the United States, Seattle fosters a unique capacity for progress and innovation in both policy and society. At a mere 160 years old, Seattle is much less established than Boston and New York, let alone the eleventh-century Danish capital. Whereas Copenhagen's long history encouraged the city to move outward instead of up, Seattle's urban development has been highly concentrated, restricted by the natural boundaries of Puget Sound and Lake Washington. Arguably, no city in the United States is as demographically homogenous as Copenhagen—and Seattle is no exception. As much as 78% of Copenhagen's 1.2 million person population identifies as Danish, with another 7% originating from Western Europe (City of Kobenhavn, 2011). Though America must grapple with the challenges of negotiating a wider array of racial, political, and socioeconomic groups than seen in Denmark, Seattle maintains a distinct regional identity that is extremely beneficial for reaching its climate policy goals. With a young, educated, and

historically liberal population (71% voted Democratic in the 2008 Presidential election (City Data, 2011)), Seattle is poised to reverse a century of urban development and consumption patterns defined by fossil fuels.

In pursuing its own carbon neutrality, Seattle, Washington has begun to follow in Copenhagen's footsteps by encouraging public participation in the policymaking process and evaluation. Because a carbon-neutral city requires increased awareness of carbon-intensive behaviors as much as of sustainable alternatives, Seattle Mayor Mike McGinn plans to guide the city in reaching its ambitious climate policy goals by seeking the direct contributions and support from his constituents (Barret, 2010). Rather than simply craft legislation to meet a specific political agenda, Seattle city government encourages reciprocal collaboration with its residents. In other words, Seattle's climate policy is a direct translation of the city's environmental consciousness into tangible outcomes. Consequently, it diverges from national and international policies, because it is so regionally specific.

To engage with the greater metropolitan community in a productive way, Mayor McGinn created a social networking website to solicit feedback from his constituents on the issues that mattered to them most. "Ideas for Seattle" immediately took off, and thousands of Seattleites made suggestions on specific policy initiatives, the majority of these related to sustainability and climate change mitigation or adaptation. City council members proposed a carbon neutrality commitment because of direct suggestions from Seattle residents via these online surveys. The resulting Seattle Climate Action Plan is a commitment shaped by public input—a measure of collaboration that few U.S. cities have achieved. *Sustainable Seattle*, an offshoot of Mayor McGinn's successful project, lists a number of characteristics essential to facilitating a sustainable community. They include: material wellbeing, governance, environmental quality, cultural vitality, education, physical health, mental health, time balance, and social connections (Sustainable Seattle, 2011). While the combination of these factors is important, the last one is perhaps the most critical, especially through its application in Seattle's carbon neutrality commitment. By engaging with existing social networks, the city has made great strides in achieving its lofty goals: as of 2009, greenhouse gas emissions were 7% below 1990 levels, and Seattleites had reduced the average carbon footprint by 20% (City of Seattle, 2009).

Perhaps the greatest focus of public participation-based strategies for climate change mitigation and adaptation in Seattle is the improvement of its transportation sector. Though founded in the railroad era, Seattle came of age during the rise of the automobile. Like many on the West coast, the city was once dominated by railways and streetcars, but began developing a more modern transportation infrastructure around the beginning of the twentieth century to better accommodate cars. By the late 1920s, major roadways coursed through the city like veins enabling the flow of people

and goods. In 1948, an estimated 221,500 vehicles crossed the city's bridges every day (Peterson & Davenport, 1950). The rapid rise of automobility in Seattle inevitably catalyzed significant environmental degradation, but this phenomenon would not be recognized as a problem until the early 1990s when the concept of "global warming" entered into international discourse. Responding to the realities of localized air and water pollution as well as to the regional threats of climate change, city government and residents alike began a collaborative relationship to reduce their collective impacts on the environment.

Mayor Greg Nickels passed the landmark Climate Protection Initiative in 2005, combining traditional protocol mechanisms with the collective interest/collective action model. To meet its targets for greenhouse gas reduction, the initiative addresses issues related to transportation, clean fuel technology, clean energy, and community engagement (City of Seattle, 2011). The first and last objectives are particularly interesting in comparison to similar initiatives within Denmark: while Copenhagen bicycle culture has merely grown larger over the last few decades, Seattle's has developed out of virtual nonexistence, and it is all due to collective action. In recognizing the linear relationship between inspiration and action, Seattle city government appealed to residents' environmental sensibilities by branding Seattle a "sustainable city." The mayor challenged residents to reduce their carbon footprints by implementing and participating in what would quickly become one of the largest, most effective bicycle cultures in the United States. The Seattle Department of Transportation installed 2,800 bike racks and 20 miles of bike lanes across the city to accommodate the 6,000 Seattleites that already commuted via bicycle each day (Seattle Department of Transportation, 2010). Following a suggestion submitted via "Ideas for Seattle," the city recently transformed highly coveted short-term auto parking spots downtown into bike racks, further encouraging Seattle residents to contribute to sustainability initiatives by modifying their behavior. This decision also provided an economic incentive by eliminating parking fees, and a cultural one by revitalizing the streets to be more pedestrian- and family-friendly.

Seattle engages in community mobilization strategies to reach its climate policy goals, because successful initiatives are often those that resonate with average residents. A subset of the Climate Protection Initiative, Climate Action Now (CAN) "encourages every resident to take action on climate change. It is a solution-oriented, grassroots effort to talk about global warming in the context of what can be done about it" (City of Seattle, 2011). The goals and methods of CAN are perhaps manifested best in a project titled "Neighbors Acting to Build Resilience and Sustainability," or NABRS. In collaboration with local nonprofits, local residents and select members of government, NABRS defined a set of twenty indicators by which neighborhoods would rate their sustainability, ranging from resource consumption to high school graduation rates

(Sustainable Seattle, 2010). The neighborhood ratings generated out of this data held tangible meaning because of the process of public participation that defined each measurement of sustainability. Neighborhood leaders disseminated these "sustainability scores" within their communities, and encouraged residents to engage in local projects to address specific issues where the neighborhood fell behind. In Rainier Beach, neighborhood leaders initiated the Efficient Energy Outreach Program. This project provided young adults with the tools and resources to complete energy efficiency audits in homes and businesses (Sustainable Seattle, 2010). The neighborhood successfully reduced its carbon emissions by improving social cohesion to achieve a common goal. By contextualizing the role of individual behavior in facilitating sustainable communities, the NABRS initiative forces local citizens to become proactive, but also allows them to reap all the rewards. This program exemplifies the resiliency and cohesive community dynamic that distinguish Seattle as a leader in social solutions to mitigation and adaptation efforts.

The NABRS program, along with the Seattle Climate Action Plan, Climate Protection Initiative, and Ideas for Seattle project demonstrates an innovative, integrative approach to climate change. While several American cities have made great strides toward sustainability, the Seattle case study is important because of the nature of this approach. By engaging the public in mitigation and adaptation campaigns, local leaders have built capacity for stronger regional commitments, laying the groundwork for a new era of legislation. This American city is no Copenhagen, but then again, the challenges for climate policy in the United States are far greater than those in the tiny Scandinavian state of Denmark.

Conclusion

The struggle to implement effective climate policy is a reflection of the scale of the climate change problem. Uncertainties abound and policymakers are unprepared to mitigate and adapt to shifts in environmental quality, because the extent of potential degradation cannot yet be accurately predicted. Ambitious if somewhat abstract commitments and regulations seem appropriate, since big, comprehensive measures naturally hold greater weight than smaller ones. It is for this reason that "climate change policy generally includes targets and large-scale reductions, not necessarily how to address on the ground individual or group activities at a smaller scale" (Romolini, 2011: 5). Yet as discourse on climate change and climate policy develops, these concerns can no longer be ignored.

History suggests that Denmark and the United States diverged early on, forced down dissimilar pathways by a variety of factors, until reaching nearly opposite ends. Copenhagen is an international model for effective urban sustainability, while Seattle's measured progress encourages cities

faced by similar challenges to follow suit. Collective action is strong in both cases, suggesting that a radical shift to the contemporary political model requires much less effort than one might assume.

Copenhagen and Seattle are decisive case studies for several reasons. The former is an example of long-established policies for climate change mitigation and adaptation, while the latter documents the journey towards a "sustainable city." While sustainability is indeed the rule in Denmark and only an exception in the United States, this range is mediated by an incomprehensible number of interrelated factors. In both case studies, regional policy must overcompensate for the failures of international climate policy. Copenhagen climate policy originates at the national level, and Seattle often acts independently of U.S. policy. By measuring the strength and capacity of social capital within these cities, the efficacy of social action solutions for climate change becomes overwhelmingly evident.

Despite their respective successes and accomplishments, Copenhagen and Seattle are not perfect. Both cities function on national and international levels, and must constantly renegotiate local realities against global expectations. This requirement presents many challenges, but also many opportunities: there is undeniably much room for improvement with regard to national and international climate policy, but it is at the local scale that effective change must occur first. Strengthening the relationship between individuals and the city is crucial to achieving mitigation and adaptation policy goals. Copenhagen and Seattle demonstrate that collaboration, communication, and social integration should truly be the model for climate policy everywhere.

The lessons from Copenhagen and Seattle suggest that policymakers must recognize the role of social capital in effective climate legislation. To do so is to identify creative mechanisms for engagement—new mediums of dissemination, communication, and collaboration. The rapid proliferation of online social media platforms presents an unparalleled opportunity for direct advocacy and action. By embracing technological progress to encourage participation in bottom-up mitigation and adaptation efforts, local leaders can transform existing and rapidly-growing social capital into adaptive capacity and successful action. Political discourse on climate change must consider both bottom-up and top-down models. It is only through a balanced medium of interaction that innovative approaches to mitigation and adaptation may arise.

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