

AN ABSTRACT OF THE THESIS OF

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The issue of global climate change and possible remedies has been debated between national governments since the 1970s. While some countries have adopted aggressive measures to address the issue, others have lagged in their efforts. The United States, as a key player in global climate change conferences, has focused its efforts on defanging intergovernmental agreements and dragging its heels on federal climate change and energy policy. Sweden, on the other hand, has shown itself to be a global leader in climate change policy development and emission reduction practices, both nationally and globally. The purpose of this thesis is to examine possible causes behind the United States' and Sweden's disparate historical and current climate change policies and investigate whether successful measures in Sweden could be implemented in some way in the United States.

Key Words: climate change, Sweden, United States, policy, intergovernmental

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A Comparative Study of Climate Change Policy and Actions between the United
States and Sweden

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Annie R. Jacobs, Author

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List of Acronyms

ACES	American Clean Energy and Security Act
CAA	Clean Air Act
CHP	combined heat and power
COP	Conference of the Parties
EPA	Environmental Protection Agency
ETS	Emissions Trading Scheme
FWCC	First World Climate Conference
ICC	International Chamber of Commerce
IPCC	Intergovernmental Panel on Climate Change
JI	joint implementation
MPG	miles per gallon
MWh	megawatt hour
NEP	New Environmental Paradigm
NHTSA	National Highway Traffic Safety Administration
PAMs	policies and measures
SWCC	Second World Climate Conference
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNCHE	United Nations Conference on the Human Environment
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WMO	World Meteorological Organization

Introduction

Human-induced climate change was first studied by Swedish scientists in the late 1800s, but it was not until the 1970s that the world started to pay attention.¹ Since the Industrial Revolution, human activities have released ever-increasing amounts of carbon dioxide and other greenhouse gases into the atmosphere. These gases form a cocoon around the Earth and trap energy inside, causing the atmosphere's temperature to rise. While the greenhouse effect is necessary for supporting life on Earth, a buildup of gases can change the Earth's climate and result in dangerous effects to ecosystems and human welfare.²

There has been an unprecedented steep incline in carbon dioxide emissions over the past century that does not follow the pattern of natural climate variations, a strong indicator of its human-caused nature (see Appendix, Figure 1).³ Despite the scientific evidence and an overwhelming consensus among scientists that human-induced climate change is occurring,⁴ there is still controversy in the United States among politicians and the public as to whether climate change is urgent enough that sacrifices should be made in order to prevent it.

The United States is one of the worst offenders when it comes to climate change denial. The country is second only to China in its total greenhouse gas

¹ Spencer R. Weart, *The Discovery of Global Warming*, (Harvard University Press, 2008): 5.

² "What is Climate Change?" NASA, accessed September 18, 2012, <http://www.nasa.gov/audience/forstudents/5-8/features/what-is-climate-change-58.html>.

³ "Global Climate Change: Vital Signs of the Planet," NASA, accessed August 24, 2012, <http://climate.nasa.gov/evidence/>.

⁴ Joint Science Academies, "Joint science academies' statement: Global response to climate change," <http://nationalacademies.org/onpi/06072005.pdf>.

emissions, and is one of the lowest-ranked industrialized countries on the Environmental Performance Index.⁵ Addressing the problem, however, would mean increasing energy prices, taxes, and regulations, which would cause an uproar among fiscal conservatives. The United States, as a key actor in international climate change policy efforts, has effectively undermined many intergovernmental agreements, rendering many of them essentially useless.

Sweden, on the other hand, has been one of the world leaders in emission reduction efforts. Over the past few decades, Sweden has constantly been finding new methods for decreasing its use of fossil fuels, from harnessing the body heat of commuters to power office buildings to powering fleets of buses and garbage trucks with methane produced from the entrails of slaughtered cows. Sweden has also been a key participant in international efforts, often going above and beyond the necessary measures outlined for the country.

The goal of this thesis is to analyze and compare Swedish and American involvement in minimizing the impact of climate change and attempt to compare different aspects of the two countries to find causes for these policy differences. To begin, the United States' and Sweden's involvement in significant historical actions regarding climate change policy (both intergovernmental and national) will be examined factually to establish a background of the countries' efforts. The two countries' emissions and energy use will then be compared to see whether Swedish

⁵ "2012 EPI Rankings," *Environmental Performance Index*, accessed August 23, 2012, <http://epi.yale.edu/epi2012/rankings>.

methods could be implemented in the United States. This section will focus on transportation and alternative energy sources, the former being most relevant to everyday citizens of the two countries and the latter being one of the primary methods of climate change mitigation. Finally, a comparison of the political and cultural environments of the two countries will be utilized to analyze the possible reasoning behind the major differences in the United States' and Sweden's environmental behaviors and policies. This thesis will be a comparative case study analysis using secondary resources, both quantitative and qualitative. The comparative format allows for easier juxtaposition of the two countries' policies, attitudes, and behaviors; in this way Sweden was chosen as the comparison country due to its consistently high ranking on the Environmental Performance Index (which ranks countries based on their environmental policies) and its dedication to developing alternative energy sources.^{6 7} Conservative pundits like to hold up Sweden as the image of socialism and/or communism, warning that, with President Obama in office, America is on its way to "becoming Sweden."^{8 9} Although these statements are completely unfounded, this analysis was formulated to see how

⁶ Yale Center for Environmental Law and Policy, "2010 Environmental Performance Index," http://ciesin.columbia.edu/repository/epi/data/2010EPI_summary.pdf.

⁷ Yale Center for Environmental Law and Policy, "2008 Environmental Performance Index," http://www.yale.edu/epi/files/2008EPI_Text.pdf.

⁸ "Turning America Into Sweden?" *The O'Reilly Factor*, aired May 3, 2011, accessed November 28, 2012, <http://video.foxnews.com/v/3924327/turning-america-into-sweden/>.

⁹ Bryian Revoner, "We're All Going To Hell Or To Sweden, According To Dr. Monica Crowley," *Addicting Info*, June 18, 2012, accessed November 28, 2012, <http://www.addictinginfo.org/2012/06/18/were-all-going-to-hell-or-to-sweden-according-to-dr-monica-crowley/>.

America could possibly benefit from becoming like Sweden in some way – in this case, through its climate change policies.

Overview of Intergovernmental Climate Change Efforts

The effects of climate change do not adhere to political borders and as such must be dealt with on an international level. Since the 1970s, numerous international organizations and conferences have been created for the purposes of addressing global energy and pollution concerns. From the beginning the United States and Sweden have remained key players in the international discussion on climate change and shaping global energy policies. The following section contains analyses of significant intergovernmental climate change endeavors with an emphasis on the roles of the U.S. and Sweden in promoting or obstructing these efforts.

Stockholm Conference on the Human Environment

The first international agreement of note regarding climate change in which the United States participated was the 1972 United Nations Conference on the Human Environment. The UN had originally planned on convening a fourth conference on the peaceful use of atomic energy when the Swedish delegation challenged their proposal. They acted under the influence of Inga Thorsson, a Swedish negotiator and diplomat at the UN, who was a supporter of nuclear disarmament and believed the expensive nuclear conferences only benefited the North's nuclear industry. The delegation instead proposed a conference that would

focus the world's political leadership on one topic: the environment.¹⁰ The General Assembly approved the idea, and the event was hosted by the Swedish government in Stockholm in 1972. Sweden, respected for being a neutral and progressive country in terms of disarmament, led the preparatory conference and served as consultants to Philippe de Seynes, the Under-Secretary-General for Economic and Social Affairs.¹¹

The primary concern of this UN conference was how to continue development with fewer environmental effects. While the greenhouse effect was recognized by conference proceedings, it was primarily in regards to the problem of acid rain,¹² which had caused severe damage to many of Sweden's lakes.¹³ However, the message presented by the Stockholm Conference team (that environmental issues could adversely impact economic development) is relevant to the issue of climate change today.¹⁴

The United States went into the conference with a report outlining a set of goals, several of which concerned the development of energy. Most notably and perplexing was America's goal to *expand* its use of environmentally harmful nonrenewable energy, despite the aim of the conference to develop less harmful energy sources. The report proposed exploitation of oil shale (a source of energy

¹⁰ John W. McDonald, "The United Nations Conference on the Human Environment," *International Negotiation* 1, no. 2 (1996): 223, doi: 10.1163/15718069620847772.

¹¹ Maria Ivanova, "Moving forward by looking back: Learning from UNEP's history," in *Green Planet Blues: Four Decades of Global Environmental Politics*, eds. Ken Conca and Geoffrey D. Dabelko (Boulder, CO: Westview Press, 2010), 145.

¹² Jonathan Cowie, *Climate and Human Change: Disaster or Opportunity?* (New York: Parthenon Publishing Group, 1998), 10.

¹³ UNEP, "Global Environment Outlook 3," 2002, <http://www.unep.org/geo/geo3/pdfs/Chapter1.pdf>.

¹⁴ Maria Ivanova, "Moving forward," 145.

found in sedimentary rock whose greenhouse gas emissions are worse than conventional fossil fuels) in Colorado, Utah, and Wyoming and more exploration of marine energy resources such as petroleum and natural gas.^{15 16} Almost as an aside to these goals, the report mentions that the development of technology for the production of pollution-free fuels is a high priority – somewhat contradictory to the aforementioned plans to exploit more fossil fuels, a plan whose efforts have proceeded at a glacial pace for the past forty years.¹⁷

The outcome of the Stockholm conference was a report including a set of principles and an action plan. Two of the principles (6 and 21) reflect goals especially relevant to today's energy issues. Principle 6 expresses declaratively that “the discharge of toxic substances or of other substances and the release of heat, in such quantities or concentrations as to exceed the capacity of the environment to render them harmless, must be halted in order to ensure that serious or irreversible damage is not inflicted upon ecosystems...”¹⁸ Yet most countries present at the conference, including the United States, planned to consume more fossil fuels per year than before.¹⁹

Principle 21 allows states to exploit their own resources under their own environmental policies, but they must ensure that their activities “do not cause

¹⁵ U.S. Department of State, *U.S. National Report on the Human Environment* (Washington, D.C., 1971), 37-38.

¹⁶ Ann Bordetsky et al. *Driving it Home: Choosing the Right Path for Fueling North America's Transportation Future*. (Washington, D.C.: Natural Resources Defense Council, 2007), 12.

¹⁷ U.S. Department of State, *U.S. National Report*, 38.

¹⁸ United Nations, “Declaration of the United Nations Conference on the Human Environment,” *United Nations Environment Programme*, June 16, 1972, <http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=97&ArticleID=1503&l=en>.

¹⁹ Jonathan Cowie, *Climate and Human Change*, 10.

damage to the environment of other states or of areas beyond the limits of national jurisdiction.”²⁰ This idea, while optimistic, would be near impossible to fulfill. The effects of greenhouse gas emissions, while often more severe in areas producing the most gases, cannot be constrained by national borders.

The most important result of the Stockholm Conference was the creation of the United Nations Environment Programme (UNEP) as the new intergovernmental body for the global environment, whose three primary jobs were to acquire and assess knowledge regarding environmental quality; manage environmental quality; and perform capacity building and development.²¹ Today, UNEP plays an important role in disseminating scientific information regarding climate change and other environmental problems, as well as organizing the Conferences of the Parties to the United Nations Framework Convention on Climate Change (see page 12). While the Stockholm conference’s principles may have had little effect in terms of greenhouse gases (production escalated after 1972), the founding of UNEP served as a starting point for subsequent, more effective climate change meetings and policies.

First World Climate Conference

Immediately following the 1972 conference, major industrialized countries began facing oil price shocks caused by the Arab Oil Embargo and later by the Iranian Revolution. In response, Sweden implemented an energy efficiency program and began replacing oil-fired power stations (which at the time were providing 20%

²⁰ United Nations, “Declaration...”

²¹ Maria Ivanova, “Moving Forward,” 149.

of Sweden's energy)²² with nuclear power plants.²³ The United States, although boosting development of some alternative energy sources, instead focused on producing more domestic oil.²⁴

In response to its 1976 report on the accumulation of carbon dioxide in the atmosphere, the World Meteorological Organization (WMO) hosted the First World Climate Conference in February of 1979.²⁵ It was at this conference that climate variability was recognized as being a serious problem. While more scientific than political in nature, this first climate conference led to the creation of the World Climate Programme and the eventual creation of the Intergovernmental Panel on Climate Change (IPCC) at the 1988 Toronto Conference.²⁶ The IPCC's purpose was (and is) to provide up-to-date scientific information on climate change and its impacts.²⁷

The 1979 conference spurred a series of intergovernmental conferences and publications, including the Villach Conference in 1985, at which scientists reached a consensus that the global mean temperature would rise in the first half of the 21st century, and the Brundtland Report, which advocated (among other things) the

²² "Nuclear Power in Sweden," *World Nuclear Association*, last modified August, 2012, accessed August 16, 2012, <http://www.world-nuclear.org/info/inf42.html>.

²³ Ute Collier and Ragnar E. Löfstedt, "Think globally, act locally? Local climate change and energy policies in Sweden and the UK," *Global Environmental Change* 7, no. 1 (1997): 30.

²⁴ "Energy Trends," *Union of Concerned Scientists*, February 18, 2003, accessed August 16, 2012, http://www.ucsusa.org/clean_energy/our-energy-choices/energy-trends.html.

²⁵ M. Jarraud, "How to recalibrate our response to the climate change challenge" (presentation, United Nations Climate Change Conference, Copenhagen, December 16, 2009).

²⁶ Joyeeta Gupta, "A history of international climate change policy," *Wiley Interdisciplinary Views – Climate Change* 1, no.5 (2010): 637.

²⁷ "Organization," IPCC – Intergovernmental Panel on Climate Change, accessed August 8, 2012, www.ipcc.ch/organization/organization.shtml

development of a low-energy economy.^{28 29} These and other conferences helped to build up the scientific evidence for human-induced climate change, and culminated in the publication of the IPCC's first assessment report and the Second World Climate Conference (SWCC) in 1990.

The SWCC, UNCED, and the Formation of the UNFCCC

The IPCC's report was prepared in time for the conference and confirmed the scientific evidence for climate change. However, the SWCC had disappointing outcomes, primarily due to resistance from the United States (operating under the first Bush administration). As reported by Richard Monastersky of "Science News," in the weeks leading up to the conference, at least 21 of the other Annex I countries (countries either industrialized or classified as having "economies in transition") expressed their intentions to stabilize or reduce greenhouse gas emissions. However, the American negotiators blocked all attempts to insert explicit schedules for industrialized nations to limit those emissions into the declaration.³⁰

Sweden was part of a coalition of four lead states opposing the United States, the leader of the veto coalition (the only other member being Russia after Japan broke ranks in 2000). Sweden and the other lead states wanted to negotiate a framework convention along with a protocol for limiting emissions formed within the following year, while the United States would only agree to a framework

²⁸ W. John Maunder, compiler, *Dictionary of Global Climate Change* (London: UCL Press, 1992), 218.

²⁹ World Commission on Environment and Development, *Our Common Future* (Oxford: Oxford University Press, 1987), 147.

³⁰ Richard Monastersky, "U.S. stalls on establishing CO₂ limits," *Science News* 138, no. 20 (1990).

convention. The United States was opposed to the formation of a protocol regulating carbon releases, citing that doing so would “require major changes in fossil fuel consumption and, consequently, lifestyles and the industrial structure.”³¹ President George H.W. Bush only agreed to attend the upcoming Earth Summit if the final draft of the convention did not reference binding commitments to controlling greenhouse gases.³²

The resulting declaration required little commitment to mitigation efforts and no international targets were established. The SWCC did call for the development of a framework treaty with tangible commitments and solutions that would later be adopted at the United Nations Conference on Environment and Development (UNCED) in 1992.³³

While the other participating nations had plans to establish specific emission reduction targets at UNCED, the conference shaped up to be a repeat performance of the SWCC. One of the conference’s main products was the United Nations Framework Convention on Climate Change (UNFCCC), a treaty whose primary goal was to stabilize levels of greenhouse gases in the atmosphere in a timely manner to prevent anthropogenic interference with the climate.³⁴ Sweden submitted a proposal that called for more corporate accountability, requiring corporations to

³¹ Pamela S. Chasek, David L. Downie, and Janet Welsh Brown, *Global Environmental Politics, 5th Edition*, (Boulder, CO: Westview Press, 2010).

³² Ibid.

³³ Information Unit on Climate Change, “The Second World Climate Conference,” *United Nations Framework Convention on Climate Change*, last modified May 1, 1993, <http://unfccc.int/resource/ccsites/senegal/fact/fs221.htm>

³⁴ United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992, *United Nations Framework Convention on Climate Change*, Rio de Janeiro, 1992.

adopt full-cost environmental accounting³⁵; however, International Chamber of Commerce (ICC) lobbyists forced the proposal to be withdrawn, emphasizing instead the voluntary measures corporations could take.³⁶ Many participating countries pushed once more for specific target levels for greenhouse gases to be included in the treaty. However, the United States again strongly opposed including these targets, opting instead that the treaty support a slow approach to combatting climate change.³⁷ Because a treaty that excluded the United States would be an ineffective one, many compromises were made, including leaving target levels for greenhouse gas reductions out. The final product of the UNFCCC stated that Annex I countries (which included the United States and Sweden) should reduce their greenhouse gas emissions in 2000 to “earlier levels” (presumably 1990 levels), but it did not bind governments to hold emissions to a specific level by a specific date per the United States and Russia’s stipulation.³⁸

COPs and the Kyoto Protocol

Following the establishment of the UNFCCC, participating parties agreed to meet every year to assess their progress at Conferences of the Parties (COPs). Surprisingly, at COP 2 in 1996, it was the United States who ended up advancing the progress on establishing targets and timetables for emissions reductions. The

³⁵ “The UNCED Farce,” editorial, *Multinational Monitor* 14, no. 5 (1992), accessed August 17, 2012, http://www.multinationalmonitor.org/hyper/issues/1992/05/mm0592_04.html.

³⁶ Kenny Bruno, “The Corporate Capture of the Earth Summit,” *Multinational Monitor* 14, no. 7 (1992), accessed August 17, 2012, http://multinationalmonitor.org/hyper/issues/1992/07/mm0792_07.html.

³⁷ Willett Kempton and Paul P. Craig, “European Perspectives on Global Climate Change,” *Environment* 35, no. 3 (1993): 17.

³⁸ Pamela Chasek et al., *Global Environmental Politics*.

European Union, normally the leader in such conferences, admitted to internal dissension that held back any radical proposals³⁹, so for the first time it was the United States (now under President Clinton's leadership) who led the parties to agree to negotiate "quantified legally-binding objectives" for limiting and reducing emissions.⁴⁰ The final decision mandated that parties establish a process to negotiate a protocol that would contain commitments beyond 2000 in time for the COP 3.⁴¹

It took several COPs, starting with COP 3 in Kyoto in 1997 and finishing with COP 7 in Marrakech in 2001, for the details of this protocol to be developed and final issues wrapped up. The protocol to the UNFCCC was negotiated by the Ad-Hoc Group on the Berlin Mandate at a series of meetings preceding COP 3.⁴² Part of the process involved participating parties submitting proposals for policies and measures (PAMs) to be included in the protocol through which emissions targets could be achieved; however, the United States refused to submit any PAMs on the grounds that individual parties should be able to come up with PAMs that best suited their needs.⁴³ What resulted from these and other negotiations was a legally binding document committing Annex I (industrialized) countries to:

³⁹ Neil E. Harrison, "Unexpected events in Geneva: progress toward a protocol on climate change," *Journal of Environment & Development* 6, no. 1 (1997): 85.

⁴⁰ United Nations Framework Convention on Climate Change: Second Conference of the Parties, Geneva, Switzerland, 8-19 July 1996, *Report of the Conference of the Parties on its second session, held at Geneva from 8 to 19 July 1996. Addendum. Part two: Action taken by the Conference of the Parties at its second session*, Geneva, 1996.

⁴¹ Farhana Yamin, "The Kyoto Protocol: Origins, Assessments, and Future Challenges," *Review of European Community & International Environmental Law* 7, no. 2 (1998): 115.

⁴² *Ibid.*

⁴³ *Ibid.*, 116.

Ensur[ing] that their aggregate anthropogenic carbon dioxide equivalent emissions of the greenhouse gases listed...do not exceed their assigned amounts, calculated pursuant to their quantified emission limitation and reduction commitments...with a view to reducing their overall emissions of such gases by at least 5 per cent below 1990 levels in the commitment period 2008 to 2012.⁴⁴

While the protocol called for a reduction of at least 5%, several countries adopted alternate targets, the United States being one of them, with a target reduction of 7%. Sweden was allowed to *increase* emissions by 4% due to their superior progress in abating carbon dioxide levels since the 1970s; however, Sweden rejected this offer and chose instead to decrease emissions by 4% below 1990 levels by 2010.⁴⁵

The protocol includes a variety of PAMs from which states could choose, including energy efficiency policies, protection of carbon sinks and reservoirs, and research on and use of renewable energies. Different methodologies by which states could enact these efforts were included.⁴⁶ Three of these methods, called “flexible mechanisms,” allow for alternative, more cost-effective routes toward reaching emission reduction targets. One of these three, joint implementation (JI), had originally been proposed by the United States at COP 2. JI allows Annex I to fund projects in other Annex I countries (usually those considered to be developing or have “economies in transition”) that would reduce emissions. The developed country could then count those reductions toward its target.⁴⁷ Sweden has

⁴⁴ United Nations Framework Convention on Climate Change: Third Conference of the Parties, Kyoto, Japan, 1-10 December 1997, “Article 3,” *Kyoto Protocol to the United Nations Framework Convention on Climate Change*, Kyoto, 1998.

⁴⁵ Ministry of the Environment, “The Swedish Climate Strategy – Summary Gov. Bill,” 2001, <http://www.sweden.gov.se/content/1/c6/02/05/22/bb5baf61.pdf>.

⁴⁶ Joyeeta Gupta, “A history of...”, 643.

⁴⁷ Neil E. Harrison, “Unexpected events,” 85.

implemented some of the most successful and innovative emission-reduction programs in several Baltic and Eastern-European nations.⁴⁸ However, Sweden has opposed the idea of sharing surpluses of reductions on the grounds that doing so would make reducing more than is required (as Sweden has done) useless.⁴⁹

In order for the Kyoto Protocol to enter into force, it required ratification by 55 countries, which needed to include countries contributing at least 55% of the total carbon dioxide emissions emitted by Annex I countries in 1990. This number had been specifically chosen in order to prevent the United States from having total veto power (the United States accounted for 36% of 1990 emissions).⁵⁰ Despite this attempt at a built-in provision, if the United States did not ratify, virtually all other industrialized nations would have to assent to the protocol⁵¹ – and with a Republican Congress in power, the outlook for the United States’ ratifying the protocol looked bleak.⁵² Prior to COP 3, the Senate had passed the Byrd-Hagel Resolution 95-0, which declared that the Senate would not ratify any protocol or treaty mandating commitments to limiting or reducing greenhouse gas emissions unless developing countries were also subject to limits within the same compliance period.⁵³ Because this stipulation was not met, the Clinton administration did not bother to even submit the protocol to the Senate to be ratified. Additionally, the

⁴⁸ Mercedes Fernández Armenteros and Axel Michaelowa, “Joint Implementation and EU Accession Countries,” *HWWA Discussion Paper*, (2002): 8.

⁴⁹ Ministry of the Environment, “The Swedish Climate Strategy,” 11.

⁵⁰ Farhana Yamin, “The Kyoto Protocol,” 126.

⁵¹ Herman Ott, “The Kyoto Protocol,” *Environment* 40, no. 6 (1998): 44.

⁵² Farhana Yamin, “The Kyoto Protocol,” 126.

⁵³ S. Res. 98, 105th Cong., 1st sess. (July 25, 1997), *Cong. Rec.*: S8113.

second Bush administration withdrew from the Kyoto Protocol in March of 2001.⁵⁴

However, the United States continues to send delegations to the COPs.

Despite concerns that the United States' withdrawal would prevent the Kyoto Protocol from entering into force, enough major Annex I parties (including Sweden) ratified, comprising 63.7% of the total 1990 carbon dioxide emissions. As such, the Protocol went into force in February of 2005.⁵⁵ By 2008, Sweden had decreased its emissions to 10.9% below 1990 levels, and its joint implementation programs helped Baltic countries Latvia, Estonia, and Lithuania reduce their emissions by 53.9%, 52.4%, and 50%, respectively.⁵⁶

Since the United States' withdrawal from Kyoto, its only participation of note in international climate change policy efforts is its involvement in the Copenhagen Accord, a nonbinding, legally unenforceable document produced by the workings at the 2009 COP 15 in Denmark. The agreement recognizes that climate change is one of the greatest challenges of the present day and that efforts should be made to keep any temperature increases to below 2°C (3.6°F), but did not include commitments for reduced emissions that would help nations to achieve that target until the following year, when participating countries were required to submit their goals.⁵⁷

⁵⁴ Warwick J. McKibbin and Peter J. Wilcoxon, "An alternative to Kyoto? A more sustainable policy for climate change," *New Economy* 9, no. 3 (2002): 133.

⁵⁵ "Status of Ratification of the Kyoto Protocol," *UNFCCC*, accessed August 18, 2012, http://unfccc.int/kyoto_protocol/status_of_ratification/items/2613.php.

⁵⁶ UNFCCC: Subsidiary Body for Implementation, 34th Session, Bonn, Germany, 6-16 June, 2011. *Compilation and synthesis of supplementary information incorporated in fifth national communications submitted in accordance with Article 7, paragraph 2, of the Kyoto Protocol*. Bonn, 2011. <http://unfccc.int/resource/docs/2011/sbi/eng/inf02.pdf>.

⁵⁷ United Nations Framework Convention on Climate Change: Fifteenth Conference of the Parties, Copenhagen, Denmark, 7-18 December, 2009, *Copenhagen Accord*, Copenhagen, 2009.

The United States committed to an emissions reduction of 17% by 2020, which would bring the country's emissions to 3.67% less than the 1990 baseline. Select climate scientists estimate that the present global pledges will still lead to an increase of 10-20% more emissions than 2010 levels by 2020 – and that even if total emissions were to be cut in half by 2050, there would still be only a 50% chance that warming would not exceed 2° C.⁵⁸ However, policy analysts and EPA researchers remain more optimistic, estimating that by stabilizing concentrations of greenhouse gas emissions at 450 parts per million, the United States has a 75% chance of holding temperature increases at 2° C.⁵⁹

⁵⁸ Joeri Rogelj et al. "Copenhagen Accord pledges are paltry," *Nature* 464, no. 22 (2010): 1126.

⁵⁹ Rebecca Lefton et al. "There's More than One Way to Reduce Global Emissions," *Center for American Progress*, December 9, 2011, accessed September 26, 2012, <http://www.americanprogress.org/issues/green/news/2011/12/09/10828/theres-more-than-one-way-to-reduce-global-emissions/>.

Analysis of National Climate Change Efforts

United States

In response to a series of occurrences of sickening and deadly smog in the 1940s and 1950s, the Clean Air Act (CAA) was passed in 1963 as one of the first environmental regulations in the United States. The law, which was amended in 1970 and again in 1990 to add more provisions, gives the EPA the power to set limits on the emissions of certain air pollutants, as well as on the amount that can be present in the air anywhere in the United States. While the six criteria pollutants monitored by the CAA (particulate matter, ground-level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, and lead) does not include the more commonly emitted greenhouse gases, the 2007 ruling that gave the EPA power to regulate greenhouse gases under the CAA would prove to be a landmark decision in the ongoing battle against global warming (see page 20).⁶⁰

Following President Bush's withdrawal from the Kyoto Protocol in 2001, dozens of climate change bills were introduced per year. The majority of them were unsuccessful, either dying in committee or voted down by the House or Senate. Several of these bills were more noteworthy than others. Beginning in 2003, Senators John McCain (R-Arizona) and Joseph Lieberman (D-Connecticut) introduced a series of three climate stewardship acts, none of which passed. The first climate bill proposed was the 2003 Climate Stewardship Act, which aimed to

⁶⁰ "Clean Air Act," Environmental Protection Agency, accessed December 5, 2012, <http://www.epa.gov/air/caa/>.

provide for a program of scientific research on climate change, establish tradable greenhouse gas allowances (and ensure benefits for consumers trading such allowances), set caps on greenhouse gas emissions in the United States at 2000 levels by 2010, and reduce dependency on foreign oil. After revisions, the bill would require the EPA to set regulations to limit greenhouse gases from electricity generation, transportation, industrial, and commercial economic sectors. It would also provide for trading of emissions credits.⁶¹ The bill was voted down, 43-55, by the Senate.⁶²

The next attempt was the 2005 Climate Stewardship and Innovation Act, a slightly modified version of the 2003 bill. The provisions of the 2005 bill were the same as those of the 2003 bill, but the revised version increased the incentives for development of climate-friendly technologies.⁶³ It was defeated in Senate by 38 votes to 60.⁶⁴

McCain and Lieberman modified the bill once more and reintroduced it in 2007 as the Climate Stewardship and Innovation Act. This version was the most bipartisan of all the past variations, drawing both Republican and Democratic co-sponsors (including then-Senator Barack Obama). The new bill, rather than setting a

⁶¹ "Summary of the Lieberman-McCain Climate Stewardship Act of 2003," *Center for Climate and Energy Solutions*, accessed August 12, 2012, http://www.c2es.org/policy_center/analyses/s_139_summary.cfm.

⁶² *Climate Stewardship Act of 2003*, S.139, Senate, 108th Cong., 1st sess., 2003.

⁶³ "GHG Emission Limits Proposals from the 109th Congress," *Center for Climate and Energy Solutions*, accessed August 12, 2012, <http://www.c2es.org/federal/congress/109/emlimits>.

⁶⁴ "U.S. Senate Roll Call Votes 109th Congress - 1st Session," *United States Senate*, accessed August 12, 2012, http://www.senate.gov/legislative/LIS/roll_call_lists/roll_call_vote_cfm.cfm?congress=109&session=1&vote=00148

2000-level cap on greenhouse gas emissions, would gradually lower the cap over time – to 2004 levels by 2012, 1990 levels by 2020, and 60% below 1990 levels by 2050.⁶⁵ However, despite its rise in support over the previous versions, the bill died in committee.⁶⁶

Later in 2007, a group of cities, states, and environmental groups challenged the EPA's argument that the CAA did not apply to greenhouse gases and thus did not fall under the EPA's power to regulate. Under the George W. Bush administration, the EPA had argued that carbon dioxide did not constitute a pollutant under the CAA. Massachusetts and the other plaintiffs involved appealed their case to the Supreme Court, who agreed to hear the case (*Massachusetts v. EPA*). The Supreme Court ruled in favor of Massachusetts, holding that the EPA had the authority to regulate greenhouse gases from mobile sources as air pollutants under the CAA.⁶⁷ After the commencement of the Obama administration in 2009, the EPA issued a proposed endangerment finding that greenhouse gases contribute to air pollution that may endanger public health or welfare.⁶⁸ Originally set to take effect in January of 2011, a permit program for facilities emitting large amounts (75,000 or more

⁶⁵ United Nations Development Programme, "Chapter 3," *Human Development Report 2007/2008*, http://hdr.undp.org/en/media/HDR_20072008_EN_Chapter3.pdf.

⁶⁶ "S.280 – Climate Stewardship and Innovation Act of 2007," *OpenCongress*, accessed August 12, 2012, <http://www.opencongress.org/bill/110-s280/show>.

⁶⁷ James Salzman and Barton H. Thompson, Jr., *Environmental Law and Policy, Third Edition*, (New York: Thomson Reuters/Foundation Press, 2010), 138-139.

⁶⁸ "EPA Finds Greenhouse Gases Pose Threat to Public Health, Welfare / Proposed Finding Comes in Response to 2007 Supreme Court Ruling," *United States Environmental Protection Agency*, April 17, 2009, <http://yosemite.epa.gov/opa/admpress.nsf>.

metric tons) of greenhouse gases was deferred by the EPA for three more years.⁶⁹ However, the EPA's new greenhouse gas emission standards for light-duty vehicles took effect in January of 2011.⁷⁰

In 2009, the House passed the American Clean Energy and Security Act (ACES), also known as the Waxman-Markey Bill, marking the first time a bill meant to control greenhouse gases in regards to climate change was passed by either of the houses of Congress. The bill proposed a cap-and-trade system where the government would set a cap on the total amount of greenhouse gases that could be emitted nationally. Companies could then buy and sell permits to emit these gases. The bill would also require large retail electric suppliers to eventually supply 20% of its electricity demand from a combination of both renewable energy sources (such as wind, solar, or geothermal energy) and energy efficiency savings by the year 2020. The bill called for subsidies for clean energy research and development while protecting consumers from energy price increases. It also calls for a 17% reduction in annual emissions from 2005 levels by 2020. Additionally, it would have provided for modernization of the electrical grid, the expanded production of electric vehicles, and mandated increases in energy efficiency in buildings,

⁶⁹ Environmental Protection Agency, "Deferral for CO₂ Emissions From Bioenergy and Other Biogenic Sources Under the Prevention of Significant Deterioration (PSD) and Title V Programs; Final Rule," *Federal Register* 76, no. 139 (2011).

⁷⁰ "Regulations & Standards: Light-Duty," *United States Environmental Protection Agency*, accessed August 14, 2012, <http://www.epa.gov/otaq/climate/regs-light-duty.htm>.

appliances, and electricity generation.⁷¹ This bill was more successful than past attempts, primarily because energy security and independence is generally a more bipartisan policy area than climate change.

Only three months after ACES was passed in the House, Senators John Kerry and Barbara Boxer introduced similar climate change legislation called the Clean Energy Jobs and American Power Act (also known as the Kerry-Boxer Bill). Kerry and Boxer's hopes were to create a more comprehensive climate change bill than previous, unsuccessful bills. Kerry-Boxer proposed a more stringent emissions reduction target than ACES – 20% by 2020, compared to 17% – but uses a similar cap-and-trade program. The bill advanced support for nuclear energy and the development of cleaner coal plants, while putting emphasis on the job creation that will result from the development of clean energy technologies.⁷² After being pushed through the Senate Committee on Environment and Public Works by Senator Boxer (despite the Republican members' boycott of the meeting)⁷³, the bill died in the Senate, with Senate majority leader Harry Reid citing a "lack of votes" as the reason for abandoning attempts to pass the bill – not one Republican senator was willing to back the bill. The Senate made the decision to focus on tightening energy efficiency

⁷¹ *American Clean Energy and Security Act of 2009*, H.R.2454, House, 111th Cong., 1st sess., 2009, bill summary and status.

⁷² "Clean Energy Jobs and American Power Act: Summary of Provisions," *U.S. Senate Committee on Environment & Public Works*, September 30, 2009, <http://epw.senate.gov>.

⁷³ "Boxer Statement on Committee Passage of S. 1733 – The Clean Energy Jobs and American Power Act," *U.S. Senate Committee on Environment & Public Works*, November 5, 2009, <http://epw.senate.gov>.

standards and responding to the Deepwater Horizon oil spill rather than climate change-based issues.⁷⁴

In April of 2011, the House passed the Energy Tax Prevention Act, a bill that would essentially reverse the decision of *Massachusetts v. EPA*. The bill would amend the CAA to no longer include greenhouse gases as air pollutants and disallow the administrator of the EPA from taking any action regarding greenhouse gas emissions to address climate change.⁷⁵ Prior to the bill's passing by the House, Representative Henry Waxman (D-CA) proposed an amendment to make evident the flagrant disregard for science that the bill posed. The amendment (which failed in the House 184-240) stated that "Congress accepts the scientific findings of the Environmental Protection Agency that climate change is occurring, is caused largely by human activities, and poses significant risks for public health and welfare."⁷⁶ The bill itself has yet to be passed by the Senate.

In March of 2012, the EPA under the Obama administration proposed its first-ever national standards limiting greenhouse gas emissions from new power plants to no more than 1,000 pounds of carbon dioxide per megawatt-hour (MWh).⁷⁷ In June of the same year, a US appeals court upheld the EPA's previously

⁷⁴ Carl Hulse and David M. Herszenhorn, "Democrats call off climate bill effort," *New York Times*, July 22, 2010, <http://www.nytimes.com/2010/07/23/us/politics/23cong.html>.

⁷⁵ *Energy Tax Prevention Act of 2011*, H.R. 910, House, 112th Cong., 1st sess., 2011.

⁷⁶ "Bill Summary & Status: 112th Congress (2011-2012): H.AMDT.245," *Library of Congress*, April 6, 2011, <http://thomas.loc.gov/cgi-bin/bdquery/z?d112:hz245:>.

⁷⁷ Felicity Barringer, "For New Generation of Power Plants, a New Emission Rule From the E.P.A.," *The New York Times*, March 27, 2012, accessed December 5, 2012, <http://www.nytimes.com/2012/03/28/science/earth/epa-sets-greenhouse-emission-limits-on-new-power-plants.html>.

proposed rules that resulted from the 2007 *Massachusetts v. EPA* ruling. In responding to four separate lawsuits, the court upheld the EPA's aforementioned 2009 finding that that greenhouse gases contribute to global warming and are a threat to public health and welfare, as well as its permit program for greenhouse gas-emitting industries and its emissions standards for cars and light trucks.^{78 79} This ruling has cleared the way for the EPA to move forward with its new power plant emissions standards, as well as future vehicle and industry emissions rules.

Sweden

Sweden has been a pioneer in terms of environmental policy, having been the first country with a national environmental protection agency (the Naturvårdsverket, founded in 1967). After the oil crisis in the 1970s, the country began reducing energy consumption and phasing out the use of fossil fuels, instead reverting to the increased use of nuclear power. This led to a 40% overall reduction in carbon dioxide emissions between 1970 and 1990.⁸⁰

In 1979, following the meltdown of the Three-Mile Island nuclear power plant in Pennsylvania, Swedes voted in favor of an eventual nuclear power phase-out (although there was no option on the ballot to vote in favor of continued nuclear

⁷⁸ Ayesha Rascoe, "Court upholds EPA's greenhouse gas rules," *Reuters*, June 26, 2012, accessed December 5, 2012, <http://in.reuters.com/article/2012/06/26/us-usa-co2-ruling-idINBRE85P10920120626>.

⁷⁹ Darryl Fears, "D.C. appeals court upholds EPA regulations to fight global warming," *The Washington Post*, June 26, 2012, accessed December 5, 2012, http://www.washingtonpost.com/national/health-science/dc-appeals-court-upholds-epa-regulations-to-fight-global-warming/2012/06/26/gJQAcZHX5V_story.html.

⁸⁰ Mikael Granberg and Ingemar Elander, "Local Governance and Climate Change: Reflections on the Swedish Experience," *Local Environment* 12, no. 5 (2007): 539.

power) in conjunction with efforts to reduce energy consumption and increased research and development of renewable energy. Subsequent to the referendum, the Swedish Parliament decided that a full phase-out would be completed by 2010.⁸¹

Phasing out nuclear power, however, could mean replacement with fossil fuels – and therefore an increase in carbon emissions. In 1988, the Swedish government, concerned about climate change, had set a target that carbon dioxide emissions be stabilized at current levels. That target was then modified by the 1993 Government Bill on Actions to Counteract Climate Change, which called for stabilization of greenhouse gases at 1990 levels by 2000, as the 1988 levels were deemed to be no longer economically feasible. This decision was confirmed with Sweden's signing of the UNFCCC.⁸² As removing the carbon cap was not an option, Sweden instead imposed a carbon tax in 1991 with the Energy Act – only the second country to have done so (after Finland's establishment of a carbon tax in 1990).

The Swedish government currently levies an energy tax on all fossil fuels not used for industry or electricity production (although there is a tax on consumer electricity consumption), a general carbon tax of 36.5 öre/kg CO₂ (approximately \$150/ton CO₂), taxes on sulphur, nitrogen oxides, nuclear energy production, and a value added tax on energy. In 2007, Sweden announced its plan to increase petrol (gas) prices as a result of its increased fuel tax, bringing it to its current (fluctuating)

⁸¹ Johan Bergenäs, "Sweden Reverses Nuclear Phase-out Policy," *Nuclear Threat Initiative*, November 11, 2009, <http://www.nti.org/analysis/articles/sweden-reverses-nuclear-phase-out/>.

⁸² Ragnar E. Löfstedt, "Sweden's future energy policy," *Energy Policy* 25, no. 4 (1997): 383.

price of 14.18 SEK/liter, or approximately \$7.96/gallon.⁸³ The carbon tax, combined with Sweden's pre-existing energy tax on fossil fuels, strongly dissuades use of fossil fuels. In 2011, the carbon and energy taxes combined on petrol totaled 5.50 kronor/liter (approximately \$3.10/gallon).⁸⁴ Were this tax in place in the United States, the average car driver would end up paying around \$1,800 per year in gas taxes alone (based on an average of 13, 476 miles driven annually with a fuel economy of 23 MPG).^{85 86}

Following the establishment of the carbon tax and the decision to phase out nuclear power, Sweden passed a series of climate-change focused bills. In 1997, the government passed a resolution calling for Swedish emissions of carbon dioxide in the energy sector to be as limited as possible in relation to other countries (thus preventing the imposition of stronger standards on Sweden than other countries impose on themselves).⁸⁷ That year the Transport Policy for Sustainable Development Bill determined that by 2010, emissions from transportation should be stabilized at 1990 levels – a goal that would require improved efficiency of

⁸³ Bengt Johansson, "Economic Instruments in Practice 1: Carbon Tax in Sweden," *Swedish Environmental Protection Agency*, 2000, <http://www.oecd.org/science/innovationinsciencetechnologyandindustry/2108273.pdf>.

⁸⁴ Swedish Energy Agency, *Energy in Sweden 2011*, (CM Gruppen AB, 2011): 25.

⁸⁵ Office of Highway Policy Information, "Average Annual Miles per Driver by Age Group," *U.S. Department of Transportation - Federal Highway Administration*, last modified April 4, 2011, accessed September 26, 2012, <http://www.fhwa.dot.gov/ohim/onh00/bar8.htm>.

⁸⁶ "Average Fuel Efficiency of U.S. Passenger Cars and Light Trucks," *Research and Innovative Technology Administration – Bureau of Transportation Statistics*, last modified January 2012, accessed September 26, 2012, http://www.bts.gov/publications/national_transportation_statistics/2011/html/table_04_23.html.

⁸⁷ Ministry of the Environment, "The Swedish Climate Strategy," 4.

transport vehicles and more renewable fuels.⁸⁸ The Environmental Objectives Bill, passed in 1999, established that international activity should focus on stabilizing the concentration of carbon dioxide at less than 550 parts per million and preventing the concentrations of other greenhouse gases from increasing.⁸⁹

Sweden has been a participant in a European renewable energy certificate system since 1999. In 2003, Sweden created its own similar system in cooperation with Norway.⁹⁰ This system gives electricity producers a certificate for each MWh of electricity they produce from renewable energy. The producers can then sell those certificates, which are traded on an open market. Electricity suppliers are obligated to purchase certificates in proportion to their electricity sales, the cost of which is then passed on to customers of the supplier. As the certificates are cancelled once a year, a constant demand for certificates is created.⁹¹ Types of renewable energy eligible for certificates include wind power, hydropower, wave energy, solar energy, geothermal energy, and biofuel.⁹² This system, while imposing higher costs on electricity for suppliers and consumers, incentivizes the production of renewable energy and distributes the costs among the three involved parties.

⁸⁸ Ibid.

⁸⁹ Ibid.

⁹⁰ "Energy certificates – what are they?" *Swedish Energy Agency*, January 27, 2003, http://www.svk.se/global/09_about_us/pdf/energy_certificates_what_are_they.pdf.

⁹¹ "The Swedish Electricity Certificate System," *Swedish Energy Agency*, accessed August 20, 2012, http://www.energimyndigheten.se/Global/Engelska/About%20us/Illustration_gemensammarknad_ENG.pdf.

⁹² "Energy certificates – what are they?" *Swedish Energy Agency*.

In 2007, Sweden's government proposed (and voters approved) a congestion tax of 10-50 kronor (approximately \$1.50 to \$7.50) on cars driving in and out of Stockholm during the workweek.⁹³ Designated "green" vehicles, however, are exempt from the tax, thus creating an incentive to drive electric or hybrid cars.⁹⁴ Should car owners fail to pay their congestion taxes on time, they are charged a fee of 500 kronor (about \$75).⁹⁵

In June of 2010, in order to help achieve the country's 2009 goal of being carbon-neutral by the year 2050, the Swedish Parliament narrowly decided to overturn its 30-year moratorium on construction of new nuclear power plants. Currently there are only plans to replace Sweden's remaining ten reactors, but regulations for requirements that the new reactors must meet should be completed by 2014.⁹⁶ There is some speculation, however, as to how long legislation allowing new power plants will last in the face of oppositional parties who vow to try to reinstate the old laws when they are in power.⁹⁷

As part of the European Union, Sweden is bound to their commitments under the Kyoto Protocol. This includes a series of emission reduction goals for the EU, such as cutting emissions to 20% below 1990 levels by 2020, and 80-95% below

⁹³ "Congestion tax in Stockholm," *Swedish Transport Agency*, last modified July 12, 2010, <http://www.transportstyrelsen.se/en/road/Congestion-tax/Congestion-tax-in-stockholm/>.

⁹⁴ "Exemptions," *Swedish Transport Agency*, last modified March 29, 2010, <http://www.transportstyrelsen.se/en/road/Congestion-tax/Congestion-tax-in-stockholm/Exemptions/>.

⁹⁵ "Congestion tax," *Swedish Transport Agency*.

⁹⁶ "Nuclear Power in Sweden," *World Nuclear Association*.

⁹⁷ "New phase for Swedish nuclear," *World Nuclear News*, June 18, 2010, accessed August 20, 2012, http://www.world-nuclear-news.org/NP_New_phase_for_Swedish_nuclear_1806101.html.

1990 levels by 2050.⁹⁸ Sweden itself, as previously mentioned, has slightly loftier ambitions, but remains committed to helping the EU achieve its goals. Sweden also takes part in the EU Emissions Trading Scheme (ETS), which is a cap-and-trade system, as a method to meet the Kyoto commitment to reduce emissions.⁹⁹

⁹⁸ "What is the EU doing about climate change?" *European Commission: Climate Action*, last modified September 10, 2012, http://ec.europa.eu/clima/policies/brief/eu/index_en.htm.

⁹⁹ "The EU ETS in Sweden," *Naturvårdsverket*, last modified February 7, 2012, <http://www.naturvardsverket.se/en/In-English/Start/Legislation-and-other-policy-instruments/Economic-instruments/The-EU-ETS-in-Sweden>.

Comparison of Political and Cultural Environments

The wide gap between Sweden's and the United States' actions regarding climate change can be jarring. They are both highly industrialized capitalist countries, looking to boost their economies, so why are their policies on environmental matters so dissimilar? By comparing their respective prevailing social paradigms and political views, these differences between Sweden and United States in their involvement and compliance with international climate change agreements and the development of domestic climate change and energy policies can be examined.

The concern Swedish citizens have for environmental issues mirrors Sweden's strong and proactive environmental policies. A study performed by Anna Olofsson and Susanna Öhman, senior lecturers in sociology at Mid Sweden University, analyzed data from the environmental concern survey of the International Social Survey Program conducted in 2000.¹⁰⁰ Their report, a comparison study between the Scandinavian nations and the United States, defines "environmental concern" based on three indicators: (i) willingness to make financial sacrifices for the environment, (ii) resigned attitudes to the environment (the belief that environmental issues are exaggerated, that it is too difficult to protect the environment, that there are more important things to protect, and that there's no point unless others do the same), and (iii) political behavior (in regards to environmentalism). The report showed that citizens of Sweden had the highest

¹⁰⁰ Anna Olofsson and Susanna Öhman, "General Beliefs and Environmental Concern: Transatlantic Comparisons," *Environment & Behavior* 38, no. 6 (2006): 768-790.

levels of concern on all three indicators, while citizens of the United States had the lowest levels of concern in the two indicators of resigned attitudes and financial sacrifices.¹⁰¹

The World Values Survey, in its 2005-2007 wave of testing, also shows Swedish citizens' concern about climate change and environmental pollution. When asked, 93.6% of those surveyed expressed that they viewed global warming and the greenhouse effect as being a "somewhat serious" or "very serious" problem, and 68.4% would agree to tax increases if the extra money were used to prevent environmental pollution. In contrast, 78.7% of Americans surveyed saw global warming and the greenhouse effect as being a serious problem, and 49.1% would agree to a tax increases to help the environment. A recent Pew Research Center study found the former statistic to be even lower, with 67% of Americans believing there to be solid evidence for global warming and only 42% believing the changes to be caused by human activity.¹⁰² Americans were more likely than Swedes to see environmental pollution as a problem that should be taken care of by the government while incurring no personal cost to them. Of Americans, 62.9% believed that the government should take full financial responsibility, while only 29.5% of Swedes agreed.¹⁰³ Additionally, 98% of Swedes (more than any other European

¹⁰¹ Olofsson and Öhman, "General Beliefs and Environmental Concern," 768-790.

¹⁰² Pew Research Center, "More Americans Say There Is Solid Evidence of Global Warming," *Pew Research Center Publications*, October 15, 2012, pewresearch.org/pubs/2388/global-warming-climate-change-solid-evidence-human-activity-earth-warmer.

¹⁰³ World Values Survey, *Integrated EVS/WVS 1981-2008 Variables*, 2011, http://www.wvsevsvdb.com/wvs/WVSIntegratedEVS_WVS.jsp?Idioma=I.

Union country) agreed that they had a duty to protect nature, even if that meant limiting “human progress” (implying advances in science, technology, and innovation).¹⁰⁴

How the dominant value systems in the two countries contribute to their respective environmental paradigms can help to explain the gaps regarding environmental concern between them. The World Values Survey assesses and categorizes nations based on a variety of factors, such as religion, politics, and economic and social life. As of 2008, the survey indicated that religion plays very different roles in Sweden and the U.S. respectively, more than any other area of human concern.¹⁰⁵ This disparity in the value placed on religion (and its relation to political ideology) can help to explain some of the differences in environmental values between the two nations.

America, despite not having a national religion, has a predominantly Christian culture and worldview. As such, its views regarding the environment have been based around Christian axioms.¹⁰⁶ 107 Seventy-eight percent of Americans identify themselves as Christians, whereas Swedish citizens as a whole are unreligious, with only 17% acknowledging religion as being an important part of

¹⁰⁴ European Commission, “Social values, Science and Technology,” *Eurobarometer*, June, 2005, 21, http://ec.europa.eu/public_opinion/archives/ebs/ebs_225_report_en.pdf.

¹⁰⁵ Ronald Inglehart and Christian Welzel, “Changing Mass Priorities: The Link Between Modernization and Democracy,” *Perspectives on Politics* 8, no. 2 (2010): 554.

¹⁰⁶ Pew Global Attitudes Project, “U.S. Stands Alone In Its Embrace of Religion Among Wealthy Nations,” *Pew Research Center*, December 19, 2002, <http://www.pewglobal.org/2002/12/19/among-wealthy-nations/>.

¹⁰⁷ Donald Worster, *Nature's Economy: A History of Ecological Ideas*, (Cambridge, England: Cambridge University Press, 1994): 26-29.

their daily lives (as compared to 65% of Americans),¹⁰⁸ and only 23% believing in the existence of a God, despite Sweden's having been a Christian nation until 2000.^{109 110}

Of all the major religions in the world, Christianity has been claimed to be the most anthropocentric and anti-natural.^{111 112} One of the first proposals of this idea was by historian Lynn White, Jr. in the 1960s. The "Lynn White thesis," in summary, postulates that in the mind of the average Christian, nature's chief function is to serve man's needs.¹¹³ This view of the relationship between Christianity and the environment has been challenged by social scientists since then, arguing that White's thesis ignores the idea of stewardship Christians have for the world their god created. A 2007 study by social scientists Darren Sherkat and Christopher Ellison found that church participation actually encouraged nonpolitical pro-environmental behaviors as a result of participants receiving messages of environmental responsibility and stewardship.¹¹⁴

On the other hand, a survey conducted in 2009 by the Pew Forum on Religion and Public Life supported a link between strict Christianity and lessened

¹⁰⁸ Steve Crabtree, "Religiosity Highest in World's Poorest Nations: United States is among the rich countries that buck the trend," *Gallup Global Reports*, August 31, 2010, <http://www.gallup.com/poll/142727/religiosity-highest-world-poorest-nations.aspx>.

¹⁰⁹ Charlotte Celsing, "Are Swedes losing their religion?" *Sweden.se*, September 1, 2006, <http://www.sweden.se/eng/Home/Society/Religion/Reading/Are-Swedes-losing-their-religion/>.

¹¹⁰ European Commission, "Social values, Science and Technology," 9.

¹¹¹ Pew Forum on Religious and Public Life, *U.S. Religious Landscape Survey*, 2008, <http://religions.pewforum.org/reports>.

¹¹² Donald Worster, *Nature's Economy*: 26-29.

¹¹³ *Ibid.*

¹¹⁴ Darren E. Sherkat and Christopher G. Ellison, "Structuring the Religion-Environment Connection: Identifying Religious Influences on Environmental Concern and Activism," *Journal for the Scientific Study of Religion* 46, no. 1 (2007): 71-85.

environmental concern (as it applies to climate change). Among Americans, white evangelical Protestants and black Protestants were the least likely to believe that global warming was caused by human activity (34% and 39%, respectively, as compared to 47% of the total U.S. population), with white evangelical Protestants being the most likely to believe global warming was not occurring at all (31%, as compared to 21% of the total U.S. population).¹¹⁵

While Sherkat and Ellison's study did not find a significant connection between Christianity and lessened environmental concern, the study did reveal a strong link between religious participation and political conservatism. Political conservatism was found to both call into question the seriousness of environmental problems and stifle political environmental activities.¹¹⁶ A study performed by social scientists Aaron McCright and Riley Dunlap reached the similar conclusion that conservative white males were most likely to be engaged in climate denial activities, even among those who reported to understand the science of global warming.¹¹⁷ Thus, even if there is not a definitive direct link between Christianity and lessened concern for the environment, they appear to be correlated: more Christians are politically conservative, and conservatives tend to be less supportive of environmental initiatives. The aforementioned study built on a previous study

¹¹⁵ Pew Forum on Religion & Public Life, "Religious Groups' Views on Global Warming," 2009, <http://www.pewforum.org/Science-and-Bioethics/Religious-Groups-Views-on-Global-Warming.aspx>.

¹¹⁶ Darren E. Sherkat and Christopher G. Ellison, "Structuring the Religion-Environment Connection."

¹¹⁷ Aaron M. McCright and Riley E. Dunlap, "Cool dudes: The denial of climate change among conservative white males in the United States," *Global Environmental Change* 21, no. 4 (2011): 1163-1172.

performed by Dunlap, Peter Jacques, and Mark Freeman which linked over 92% of environmentally skeptical written works to conservative think tanks, and found that over 90% of conservative think tanks advocate environmental skepticism. They also argue that U.S. protective policy efforts have declined since the rise of a conservative movement in the 1970s.¹¹⁸

This idea seems contradictory to actions Americans took during the 1970s, or the “environmental decade,” during which the American population seemed to be moving toward agreement with the “New Environmental Paradigm” (NEP). The NEP challenges the previous value of humans as being dominant over nature and places the responsibility for environmental degradation on human beings.¹¹⁹ However, the effectiveness of this viewpoint was subverted by the subsequent elections of Republican presidents like Ronald Reagan, George H.W. Bush, and George W. Bush.

The politically conservative ideology is often rooted in Christianity, emphasizes deregulation, and promotes capitalism. President Nixon defied his conservative, anti-regulation roots in creating the EPA and by playing a lead role at the UNCHE to satisfy the growing body of environmentalist voters in America in the early 1970s. But conservative candidates following the 1970s began a campaign to undermine environmental science, not necessarily because they personally did not believe climate change science was true (although that may have been the case), but

¹¹⁸ Peter J. Jacques, Riley E. Dunlap, and Mark Freeman, “The organisation of denial: Conservative think tanks and environmental scepticism,” *Environmental Politics* 17, no. 3 (2008): 349-385.

¹¹⁹ Riley E. Dunlap, Kent D. Van Liere, Angela G. Mertig, and Robert Emmet Jones, “Measuring endorsement of the new ecological paradigm: A revised NEP scale,” *Journal of Social Issues* 56, no. 3 (2000): 425-442.

arguably because it meant they could avoid imposing environmental regulations on industries, which would secure the funding and votes of their corporate constituency.¹²⁰ As a result of this climate change denial campaign led by political figures and encouraged by conservative media, skepticism of the validity of scientific evidence for anthropogenic climate change has begun to grow among the American populace. Thus, American involvement in international environmental agreements has essentially stagnated.

In contrast to America's political environment, many European countries are characterized as having prominent social democratic political parties. This ideology advocates the provision of universally-accessible services such as health care, education, child care, and so on by the government, generally through higher taxation.¹²¹ Akin to social democracies is the concept of a welfare state, which redistributes tax revenue to those who cannot afford basic provisions needed to live. The Nordic countries (Sweden, Iceland, Norway, Denmark, and Finland) are all welfare states.¹²² That these countries are so accustomed to being taxed and regulated could explain the Swedish people's willingness to pay to support the environment and their acceptance of stronger climate change policies. Sweden is both a social democracy and a welfare state, and as such its citizens are used to high taxes for public goods and extensive regulations. Even Sweden's currently-ruling

¹²⁰ Riley E. Dunlap, "The new environmental paradigm scale: From marginality to worldwide use," *The Journal of Environmental Education* 40, no. 1 (2008): 3-18.

¹²¹ Nick Stevenson, "European Democratic Socialism, Multiculturalism, and the Third Way," *Cultural Studies* 23, no. 1 (2009): 50-51.

¹²² Kimberly Earles, "Swedish Family Policy – Continuity and Change in the Nordic Welfare State Model," *Social Policy and Administration* 45, no. 2 (2011): 180.

Moderate Party, which champions tax cuts and deregulation and whose policies could be considered similar to those of the GOP, is in support of environmental taxation and further climate change research and programs.¹²³ This is unlike America, which, at least during conservative presidencies, predominantly stresses deregulation and low taxes.

As previously mentioned, the 2011 World Values Survey revealed that Swedish citizens were less likely than Americans to expect the government to take full financial responsibility for environmental pollution. This is partly due to the way in which the Swedish government markets their environmental policies. Policies place emphasis on the human-caused damage to the environment as it is today and place the blame on current unsustainable lifestyles. Swedes are encouraged to “live and act environmentally adapted,” meaning that they recognize that their personal actions have global consequences.¹²⁴ Swedish mass media is also prominent in dissemination of accurate scientific research on climate change, and does not try to address the fallacious “other side” (climate denial) the way that American media has a tendency to do.¹²⁵

While Sweden’s concern for climate change and the threat to the environment that it poses has steadily increased with each new scientific development, the

¹²³ “Statement of Government Policy presented by the Prime Minister, Mr Fredrik Reinfeldt, to the Swedish Riksdag on Friday, 6 October 2006,” *Regeringskansliet*, accessed October 9, 2012, <http://www.regeringen.se/content/1/c6/07/15/51/71d8a385.pdf>.

¹²⁴ Simon Matti, “Exploring Public Policy Legitimacy: A Study of Belief-System Correspondence in Swedish Environmental Policy,” (doctoral thesis, Luleå University of Technology, 2009): 177.

¹²⁵ Liisa Antilla, “Self-censorship and science: a geographical review of media coverage of climate tipping points,” *Public Understanding of Science* 19, no. 2 (2010): 243.

international and national stances of the United States on the seriousness of climate change have varied significantly with each new presidential administration, though the underlying American traits, such as religion and individualistic values, have largely maintained continuity. Though this analysis of American and Swedish cultural attitudes and political views only scratches the surface of the issue, it lays down some of the more significant motivations and societal structures supporting Sweden's progressive climate change actions and America's lagging efforts. These can serve as a basis for explaining the differences in greenhouse gas emissions and energy use between the two countries.

Comparison of Emissions and Energy Sources

Since the 1960s, Sweden has been developing energy alternatives to oil, beginning with nuclear power. America tends toward nonrenewable resources for its energy, due in part to its large coal, natural gas, and oil reserves (America's coal reserves are the largest in the world).¹²⁶ In 2006, Sweden's Prime Minister, Göran Persson, announced the government's plan to be a completely oil-free society by 2020¹²⁷ and to have no net carbon emissions by the year 2050.¹²⁸ Sweden has focused on modifying its vehicle fleet and expanding its alternative sources of energy in order to achieve this goal. This section will compare the two countries' biggest sources of greenhouse gas emissions: transportation use and energy sources used to generate electricity and heating.

Transportation

Domestic transport represents one of the largest sources of greenhouse gas emissions in Sweden. Since 1990, the percentage of emissions from transport has ranged between 30-33% of total emissions.¹²⁹ As of 2007, domestic transport accounted for 31% of total greenhouse gas emissions in Sweden.¹³⁰ The oil commission is working on expanding research into biofuels (such as ethanol),

¹²⁶ World Energy Council, *2010 Survey of Energy Resources*, (London: World Energy Council, 2010): 10.

¹²⁷ Commission on Oil Independence, *Making Sweden an Oil-Free Society*, June 21, 2006, <http://www.sweden.gov.se/content/1/c6/06/70/96/7f04f437.pdf>.

¹²⁸ Regeringskansliet, *Sweden's Fifth National Communication on Climate Change Under the UNFCCC*, (Stockholm: Edita Sverige AB, 2009): 34.

¹²⁹ Regeringskansliet, *Sweden's Second National Communication on Climate Change Under the UNFCCC*, (Stockholm: Edita Sverige AB, 1997): 10.

¹³⁰ Regeringskansliet, *Sweden's Fifth National Communication*, 31.

funneling resources into public transportation, and promoting telecommuting as strategies to reduce the consumption of oil in road transport by 40-50%¹³¹ and achieve the long-term goal of vehicles in Sweden to be independent of fossil fuels by 2030.¹³² Despite Volvo not having been owned by Sweden since 1999,¹³³ Volvo models account for three of the top five best-selling vehicles in Sweden. These vehicles are not currently meeting particularly high fuel economy standards (both the V70 and S60 average 21 MPG and the V50 averages 24 MPG).¹³⁴ In fact, Sweden's major failing when it comes to greenhouse gas abatement is having the highest pollution-emitting cars in Western Europe.¹³⁵ Sweden's Volvo loyalty may not be a barrier to achieving an oil-free society, however; Volvo announced that they would begin making a plug-in/diesel hybrid model of the V70 in 2012, and many of their models are set up to use both ethanol and gas.¹³⁶ Were car-buying trends to continue along the same line, the addition of Volvo hybrids and more diesel- and ethanol-fueled cars could boost the fuel economy of the top five vehicles into the 35+ MPG range.

¹³¹ COI, *Making Sweden an Oil-Free Society*, 4.

¹³² Swedish Energy Agency, *Energy in Sweden 2011*, 10.

¹³³ "1990-1999," *Volvo Group Global*, accessed September 27, 2012, <http://www.volvogroup.com/group/global/en-gb/volvo%20group/history/ourhistory/1990/Pages/1999.aspx>.

¹³⁴ "Topplistan Juli 2012," *BIL Sweden*, August 1, 2012, http://www.bilsweden.se/ny_statistik/topplistor_1.

¹³⁵ Ivar Ekman, "In Sweden, It's Global Warming vs. Big Heavy Cars," *The New York Times*, July 5, 2007, accessed August 24, 2012, <http://www.nytimes.com/2007/07/05/business/worldbusiness/05emit.html>.

¹³⁶ "Volvo Planning Driveline Architectures All To Be Plug-in Hybrid Capable; Considering a Range-Extended Electric-Drive Architecture in the Future," *Green Car Congress*, October 5, 2010, <http://www.greencarcongress.com/2010/10/volvophev-20101005.html>.

The same cannot be said, however, of American vehicles. Over the past 20 years, a smaller percentage of America's greenhouse gas emissions has come from transportation than it has for Sweden (ranging from 25% of total emissions in 1990 to a consistent 27-28% from 2005-2010); however, America is not making the advances other countries are in terms of fuel efficiency (see Appendix, Figure 1).¹³⁷ To help move America in a more fuel efficient direction, President Obama has announced a new policy intended to reduce greenhouse gas emissions and fuel consumption, requiring an average fuel economy standard of 35.5 MPG (37 for passenger cars and 30 for light trucks) by 2016 and a standard of 54.5 MPG by 2025.^{138 139}

Both the EPA and the National Highway Traffic Safety Administration (NHTSA) will impose standards based on a vehicle's overall size, granting less stringent standards for larger vehicles. These standards, however, could render the whole process ineffective. Car buyers and manufacturers have trended toward larger vehicles over the past decade or so. When fuel economy standards were imposed in the 1970s, light trucks were granted less stringent emissions standards because the majority of truck-owners were workers and farmers whom the

¹³⁷ U.S. EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2010*, April 15, 2012, <http://www.epa.gov/climatechange/Downloads/ghgemissions/US-GHG-Inventory-2012-Main-Text.pdf>.

¹³⁸ "Obama Administration National Fuel Efficiency Policy: Good For Consumers, Good For The Economy And Good For The Country," *The White House Office of the Press Secretary*, May 19, 2009, http://www.whitehouse.gov/the_press_office/Fact-Sheet-and-Participants-at-Todays-Rose-Garden-Event.

¹³⁹ "President Obama Announces Historic 54.5 MPG Fuel Efficiency Standard," *The White House Office of the Press Secretary*, July 29, 2011, <http://www.whitehouse.gov/the-press-office/2011/07/29/president-obama-announces-historic-545-mpg-fuel-efficiency-standard>.

government did not want to punish.¹⁴⁰ However, passenger vehicles such as sport utility vehicles (SUVs), minivans, and large hatchbacks also fall under the category of “light truck,” and thus do not have to meet the more stringent emission standards that passenger cars do. The proposed fuel economy standards for 2016 would produce a slow progression overall, considering how the countries of Europe and Japan are projected to have fuel economy standards of 45-50 MPG between 2012 and 2016 (see Appendix, figure 2). Additionally, these standards could be difficult to achieve and represent another failed energy policy, given that the Ford F-series and Chevy Silverado, the two trucks in the top five best-selling vehicle models in America, *currently* have fuel economies around 13 MPG and 17 MPG, respectively).¹⁴¹

It may be futile to compare Sweden and America’s policies and efforts on reducing vehicle emissions. Based on purchasing patterns, it would seem that Swedes and Americans have different requirements for what their cars and trucks can handle. But the differences really arise from what consumers seem to think they need in a car. The United States is not only geographically larger as a whole, it also has more areas where the cities are spread out over larger areas.^{142 143} It seems it would be to Americans’ benefit to purchase vehicles that could give them better gas mileage for the longer distances they have to travel every day. Sweden and America

¹⁴⁰ Lee Schipper, “Moving Forward With Fuel Economy Standards,” *Access* 34, Spring (2009): 13.

¹⁴¹ “Top 20 best-selling vehicles in U.S. in June,” *Reuters*, July 3, 2012, <http://www.reuters.com/article/2012/07/03/autosales-usa-top-idUSL3E8I33Q720120703>.

¹⁴² “Road Map of Sweden,” *Highwaymaps.eu*, <http://www.highwaymaps.eu/sweden>.

¹⁴³ “United States Interstate Highway Map,” *Online Atlas*, <http://www.onlineatlas.us/interstate-highways.htm>.

both average around two children per family;¹⁴⁴ yet Americans spring for larger, gas-guzzling SUVs, believing them to be the safest choice for their family, while Swedes are more likely to go for smaller station wagons.^{145 146 147} For Americans with two or more cars, the most common pairing is a pickup truck with a standard mid-sized vehicle.¹⁴⁸ Pickup trucks are tending towards having crew or extended cabs, making the overall size bigger and therefore not subject to the stricter emissions standards passenger cars must meet – despite passengers being the purpose of these larger cabs in the first place.^{149 150}

American car buyers are also motivated to buy larger cars because they perceive them as being safer. Automakers argue that smaller vehicles are “unsafe,” ignoring the fact that small cars are primarily only unsafe because they cannot stand up to the impact of large vehicles in a two-car crash.¹⁵¹ Additionally, despite the prevalence of narrow, winding roads and smaller cars, Western Europe and Japan

¹⁴⁴ “Total Fertility Rate (Children Born Per Woman) 2012,” *U.S. Global Health Policy*, <http://www.globalhealthfacts.org/data/topic/map.aspx?ind=87#table>.

¹⁴⁵ “Top 20 best-selling vehicles in U.S.,” *Reuters*.

¹⁴⁶ Malcolm Gladwell, “Big and Bad,” *The New Yorker*, January 12, 2004, www.gladwell.com/2004/2004_01_12_a_suv.html.

¹⁴⁷ “Topplistan Juli 2012,” *BIL Sweden*.

¹⁴⁸ Experian Automotive, “New Study Shows Multiple Cars Are King in American Households,” February 12, 2008, press.experian.com.

¹⁴⁹ “New Study Shows Multiple Cars Are King in American Households,” *Experian Automotive*, February 12, 2008, <http://press.experian.com/united-states/Press-Release/new-study-shows-multiple-cars-are-king-in-american-households.aspx?&p=1>.

¹⁵⁰ Allyson Harwood and Todd Lassa, “The Future of the Compact Pickup Truck,” *Motor Trend*, December 6, 2011, http://www.motortrend.com/features/consumer/1112_future_compact_pickup_truck/viewall.html?ti=v2.

¹⁵¹ Michael Anderson and Maximilian Auffhammer, “Pounds that Kill: The External Costs of Vehicle Weight,” *National Bureau of Economic Research*, June, 2011.

have lower traffic fatality rates than America, with its large, “safe” vehicles and straight roads.¹⁵²

Possible actions America could take to reduce vehicle emissions would be to put stricter standards on what vehicles could be built and purchased new; and, if more stringent fuel economy standards are not imposed, to lift the “Chicken Tax” that puts a 25% tariff on imported light trucks. Giving larger trucks more lenient standards is not a solution for the long run, especially when almost half of new cars sold are light-duty trucks. Overall bulk of these vehicles could be reduced while maintaining the essential functions and capacity. years ago). However, strong actions taken toward restricting accessibility to certain types of cars or imposing stricter fuel economy standards could be seen by many as threats toward American individualism, a problem less likely to be faced in more collectivist Sweden. The tariff on imported trucks is outdated and protects American automakers from having to introduce trucks with fewer emissions and better fuel economy – so if the government does not want to lift that tax, it needs to impose stricter fuel-efficiency requirements on Chevy, Dodge, Ford, and so on. Taking these actions would be less likely to encroach on Americans’ freedom to purchase and drive the types of cars they like while still helping to mitigate greenhouse gas emissions.

One of the noticeable differences between Swedish and American car buyers is that Swedes seem to be able to settle for a smaller vehicle that fulfills their needs, while Americans tend to overcompensate by getting larger vehicles (as shown by

¹⁵² World Health Organization, *Global Status Report on Road Safety*, (Geneva: WHO Press, 2009).

the Swedish preference for station wagons and American preference for SUVs).¹⁵³

¹⁵⁴ If minivans, SUVs, and large hatchbacks could be re-categorized as passenger vehicles and therefore subject to stricter emissions standards and if the government could impose and *reinforce* higher fuel economy requirements without letting manufacturers work around the rules by making larger and larger vehicles, then the United States could possibly see a significant reduction in its percentage of emissions from transportation with fewer perceived invasions on Americans' rights to purchase the cars of their choice.

Alternative Energy Sources

Sweden began its transition away from oil and toward renewable energies in the 1970s, leading it to its current diverse energy portfolio. Crude oil and oil products currently supply 30% of Sweden's energy and are primarily used to power vehicles. Nuclear power comprises 27%; biofuels, peat, and waste comprise 22.9%; and hydropower supplies 10.9% of Sweden's energy sources. The remaining 9.2% is comprised of natural gas, coal, heat pumps, and wind power (see Appendix, Figure 2).¹⁵⁵ In comparison, in 2011 the United States obtained 36% of its energy from oil, 25% from natural gas, 20% from coal, 8% from nuclear power, and 9% from

¹⁵³ "Topplistan Juli 2012," *BIL Sweden*.

¹⁵⁴ "Top 20 best-selling vehicles in U.S.," *Reuters*.

¹⁵⁵ Swedish Energy Agency, *Energy in Sweden 2011*, 53.

renewable sources (hydroelectric, geothermal, solar, wind, and biomass) (see Appendix, Figure 3).¹⁵⁶

While both countries use oil in similar proportion in relation to other forms of energy, the differences in the total amount of energy used means America uses exponentially more oil than Sweden. Therefore, Sweden's energy from oil totaled 187 TWh, while oil supplied America with 10,287 TWh of energy.¹⁵⁷ ¹⁵⁸ This comes to a total of approximately 19,782 KWh of energy from oil per Swede and 33,014 KWh of energy from oil per American.¹⁵⁹ While it could be argued that America has more industry and, thus, proportionately needs more oil, the reality is that, like Sweden, the majority of oil in America goes towards powering vehicles and, thus, is primarily used by everyday Americans, not industries.¹⁶⁰ However, there could possibly be less of a discrepancy between these two per capita values if they were adjusted to exclude the oil consumed by long-distance truckers, who have much farther distances to cover in the United States than they do in Sweden. Regardless, overhauling America's vehicle standards could still be one of the most effective ways to reduce oil consumption and, subsequently, carbon dioxide emissions.

In terms of energy sources other than oil products, Sweden has developed and uses more renewable energy sources than America does. Sweden currently

¹⁵⁶ "What are the major sources and users of energy in the United States?" *U.S. Energy Information Administration*, last modified May 18, 2012, accessed August 22, 2012, http://www.eia.gov/energy_in_brief/major_energy_sources_and_users.cfm.

¹⁵⁷ Swedish Energy Agency, *Energy in Sweden 2011*, 52.

¹⁵⁸ "What are the major sources," *U.S. Energy Information Administration*.

¹⁵⁹ "The World Factbook," *Central Intelligence Agency*, accessed August 22, 2012, <https://www.cia.gov/library/publications/the-world-factbook/rankorder/2119rank.html>.

¹⁶⁰ "What are the major sources," *U.S. Energy Information Administration*.

relies mainly on hydroelectric power and nuclear power for its electricity,¹⁶¹ while America relies mainly on coal, natural gas, nuclear power, and utilizes only some renewable energy for its electricity supply.¹⁶² The geography of Sweden is ideal for hydroelectric power. While power plants are dotted on the rivers throughout the country, there are several large rivers located in the wilderness above the Arctic Circle that are protected from development in order to maintain the downstream hydroelectric plants safely. It is from these areas that the bulk of Sweden's hydroelectric power comes.¹⁶³ In 1965, Sweden began to use nuclear power to supplement hydroelectric, as the seasonal rainfall on which hydroelectric depended was unpredictable.

One of the Swedish EPA's 2009 policy goals was to reduce dependence on both hydroelectric and nuclear power and move toward the use of cogeneration, wind power, and other renewable methods and sources of power for generating electricity.¹⁶⁴ Cogeneration, or combined heat and power (CHP), is the simultaneous production of heat and electricity by a power station.¹⁶⁵ Since 2009, Sweden has ordered the manufacture of several biomass CHP plants, which burn timber waste

¹⁶¹ Swedish Energy Agency, *Energy in Sweden 2011*, 53.

¹⁶² "...energy in the United States?" *U.S. Energy Information Administration*.

¹⁶³ Alexander Farnsworth, "A pearl of power: Sweden's biggest hydroelectric plant going strong after 56 years," *Evolution* 4, no. 8 (2008).

¹⁶⁴ Regeringskansliet, *A sustainable energy and climate policy for the environment, competitiveness, and long-term stability*, 2009.

¹⁶⁵ "Cogeneration/Combined Heat & Power," *Clarke Energy*, accessed August 23, 2012, <http://www.clarke-energy.com/chp-cogeneration/>.

and sawdust from its wooded regions. The city of Kalmar has begun to replace most of its oil, gas, and electric furnaces with district heat from CHP plants.^{166 167 168}

Until recently, Sweden's capacity for wind power had been somewhat underutilized, with only 0.49% of the total energy supply coming from wind power.¹⁶⁹ However, after having released their plans in 2009 to establish Europe's biggest wind farm, Sweden got the final investments and go-ahead to begin construction. The farm will be comprised of nearly thirty wind turbines in Sjisjka, a low mountainous area in the north of Sweden, and will have an installed capacity of 78 megawatts – enough to supply electricity for 43,000 households.¹⁷⁰ Electricity production from the Sjisjka farm is expected to start in October of 2012,¹⁷¹ and two more wind farms in Jädraås and Örnsköldsvik are expected to be completed in 2013 and 2014, respectively.¹⁷²

Since President Obama's election in 2008, development of American renewable energy has increased. Energy generation from wind, solar, and

¹⁶⁶ Ben Block, "Sweden prepares to lead EU on climate," *Worldwatch Institute*, March 18, 2009, <http://www.worldwatch.org/node/6039>.

¹⁶⁷ Steve Hodgson, "Opcon to build bioenergy CHP plant in Sweden," *Cogeneration & On-Site Power Production*, May 13, 2011, <http://www.cospp.com/articles/2011/05/opcon-bioenergy-to-build-bioenergy-chp-plant-in-sweden.html>.

¹⁶⁸ Jussi Ollila, "Metso to deliver power plant to Bomhus Energi, Sweden," *Metso*, October 26, 2010, <http://www.metso.com>.

¹⁶⁹ Swedish Energy Agency, *Energy in Sweden 2011*, 53.

¹⁷⁰ Peter Kalla, *Projektbeskrivning: Vindkraft på Sjisjka (Project Description: Wind Power in Sjisjka)*, February 11, 2011, <http://o2.ntsverv.se/Upload/File/Projektbeskrivningar%20pdf/Projektbeskrivning%20Sjisjka%20110211.pdf>.

¹⁷¹ "The Sjisjka wind farm," *Skanska*, accessed August 23, 2012, <http://www.skanska.com/en/Projects/Project/?pid=7363&plang=en-us>.

¹⁷² Karl-Erik Stromsta, "Arise to buy 40-turbine wind project in northern Sweden," *Recharge News*, August 1, 2012, <http://www.rechargenews.com/energy/wind/article319171.ece>.

geothermal sources has doubled over the past four years. President Obama has issued an executive order pushing for more clean energy use by the federal government and military,¹⁷³ and has called on Congress to pass a clean energy standard that would require 80% of electric utilities' power to come from natural gas, nuclear, and renewable sources by 2035. However, historical precedent shows that implementing practices to achieve any of these goals will be difficult. The outgoing House of Representatives has been labeled "the most anti-environment house in the history of Congress," voting 191 times to weaken environmental protections in its first session alone.¹⁷⁴ In the past, most policies regarding climate change or alternative energy either do not make it out of committee or are only passed by one house of Congress.

In the most recent presidential election, the outlook for renewable energy and decreasing dependency on oil was not good. Were Republican candidate Mitt Romney to have been elected President, he would have likely reversed and further hurt any progress that had been made to limit fossil fuel use. His announced plans included green-lighting production on the controversial Keystone XL Pipeline, opening new areas for offshore drilling, and removing or loosening current

¹⁷³ "Securing American Energy," *The White House*, accessed August 23, 2012, <http://www.whitehouse.gov/energy/securing-american-energy>.

¹⁷⁴ Henry A. Waxman, Edward J. Markey, and Howard L. Berman, *The Anti-Environment Record of the U.S. House of Representatives: 112th Congress, 1st Session*, December 15, 2011, http://democrats.energycommerce.house.gov/sites/default/files/image_uploads/_Anti-Environment%20Report%20Final.pdf.

regulations restriction coal production, despite his campaign promise to make the United States more energy independent.¹⁷⁵

With President Obama's re-election, there may be some hope for the continuing development of alternative energy sources. However, many of Obama's plans barely scratch the surface of America's energy problem. For example, under Obama's command, the Department of Navy has committed to adding one gigawatt of renewable energy to its energy supply – "enough to power 250,000 homes."¹⁷⁶ However, 250,000 homes are equal to only 0.19% of America's households. Considering how almost all homes in Sweden are powered completely by hydropower, America has a long way to go. The President and future presidential candidates must realize that one of the keys to energy independence would be developing wind power, hydropower, solar power, and biofuels here in America.

¹⁷⁵ "The Romney Plan For A Stronger Middle Class: Energy Independence," *Mitt Romney*, August 23, 2012, http://www.mittromney.com/sites/default/files/shared/energy_policy_white_paper_8.23.pdf.

¹⁷⁶ "Securing American Energy," *The White House*.

Conclusion

The politics of climate change can be disheartening for those eager for effective policies in the United States. While evidence for the effects of human behavior on the climate and the impacts of climate change continue to mount, very little is being accomplished globally to mitigate this threat. The results of my analysis, comparing the public policies and attitudes of Sweden and the United States in relation to their emissions, energy use, and climate change policies, were often discouraging. The United States has done very little to account for its large role in the degradation of the natural environment. The outlook for climate change policy in the U.S. is uncertain and not promising, given that President Obama did not make climate change a primary (or even secondary) issue in his recent presidential campaign. Sweden, on the other hand, has maintained a somewhat consistent stance on acknowledging the dangers of climate change and has made great efforts to reduce its energy consumption and emissions while also raising awareness of the threat at local and international levels.

Other obstacles preventing the United States from improving its climate change and general environmental record are the public's lack of unbiased education regarding the seriousness of climate change, Americans' opposition to lifestyle changes, and a deficiency of political willpower to enact change. These obstacles continue to grow and need to be addressed so that if effective policies were to be implemented, they would not meet with as much resistance as they have

been facing so far. The discussion of climate change in the United States has been politicized to the point where the authority of the overwhelming international consensus among research scientists is being ignored by those in position to enact change. The undermining of scientific information is damaging America's status as a generally forward-thinking nation, an image the country tends to strive toward. Unfortunately, knowledge regarding the science of climate change is still no guarantee people will change their behaviors to be more environmentally-minded. A significant component of American resistance to change is short-sighted self-interest (arguably an aspect present in all people, regardless of nationality).

In the 1990s, Sweden managed to boost its economy while reducing greenhouse gas emissions through taxes and regulations, so it is not an impossible feat. However, my research suggests that there are barriers in the United States preventing it from achieving the progress in climate change mitigation achieved by Sweden – the primary barrier being its more conservative and individualistic society that is resistant to regulation. Because Sweden has not had to overcome such blocks to achieve what it has today, there may be little the United States could draw from Sweden's example without significant resistance from the American people and the majority of government.

Further investigation into other variables between the two countries could reveal further sources of differences that explain why the United States could most likely not draw from Sweden's example. These studies could include the differences in their hegemonic status (Sweden is not aiming to become the world power that America is), the development of their political systems, or their varied

demographics. The Olofsson and Öhman study referenced in the political and cultural section found that, along with political affiliation, education levels and residence (urban vs. rural) also had an influence on environmental concern, so comparing the countries on the bases of those variables could reveal more reasoning for their differences.¹⁷⁷ On the other hand, the complex nature of the United States' structure makes it difficult to compare on the whole to such a smaller country. Focusing on one region of the United States to compare would possibly yield very different results than were found here. For example, a comparison with the American West Coast could show that Sweden could learn something from us, whereas a comparison with the American South might yield similar or worse results than were presented in this paper.

Since the United States' underlying cultural and political structures differ so greatly from Sweden's, attempting to model American policies after Sweden's would most likely fail or cause even further problems. Instead, the United States will have to form its own path toward successful climate change mitigation. While a lack of environmental regulations may benefit America's economy in the short run, an investment into stronger, more sustainable climate change policies – be they national or international – will strengthen America's status as a progressive world leader long term.

¹⁷⁷ Anna Olofsson and Susanna Öhman, "General Beliefs," 780.

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Appendix

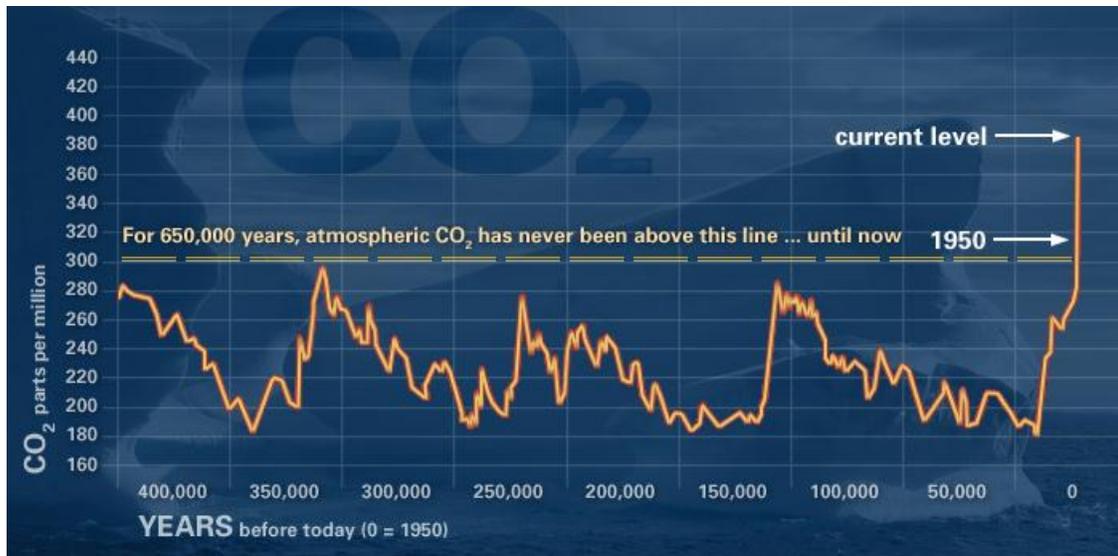


Figure 2 - Graph of atmospheric samples from ice cores and recent measurements shows the increase in atmospheric carbon dioxide since the Industrial Revolution.

“Global Climate Change: Vital Signs of the Planet,” NASA, accessed August 24, 2012, <http://climate.nasa.gov/evidence/>.

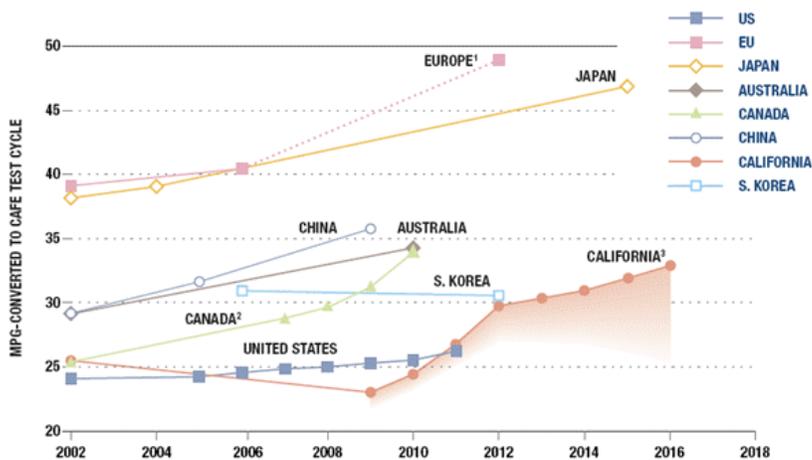


Figure 1 – Actual and Projected Fuel Economy for New Passenger Vehicles by Country.

The International Council on Clean Transportation, “US Last among Major Countries in Car Fuel Economy Standards,” *Marketing Charts*, <http://www.marketingcharts.com/topics/asia-pacific/us-last-among-major-countries-in-car-fuel-economy-standards-1141/icct-fuel-economy-mpg-standardsgif/>.

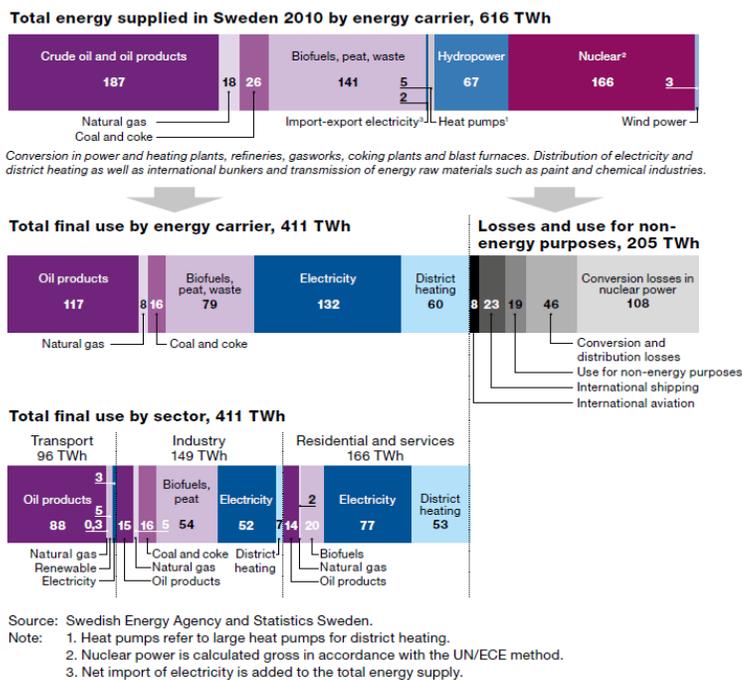


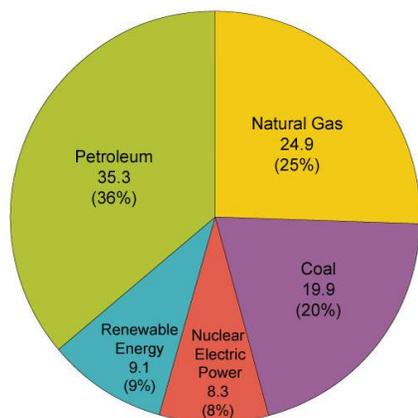
Figure 3 – Energy Supply and Use in Sweden, 2010, in TWh

Swedish Energy Agency, *Energy in Sweden 2011*, CM Gruppen AB, 2011

Primary Energy Use by Source, 2011

Quadrillion Btu and Percent

Total U.S. = 97.5 Quadrillion Btu



Source: U.S. Energy Information Administration, *Monthly Energy Review*, Table 1.3 (March 2012), preliminary 2011 data.

Figure 4 – Primary Energy Use by Source, 2011 (United States)

“What are the major sources and users of energy in the United States?” *U.S. Energy Information Administration*, last modified May 18, 2012, accessed August 22, 2012, http://www.eia.gov/energy_in_brief/major_energy_sources_and_users.cfm.