Can the Success of Carbon Emission Cap-and-Trade Market be Predicted Based on the EPA’s Acid Rain Program?

Parisa S smith, Barry University
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Parisa S. Smith

Barry University of Law

I. Introduction

Contrary to popular belief, global warming is not a new concept. Scientists have acknowledged the effects of the global warming phenomenon for the past fifty years.\(^1\) According to the United Nations Intergovernmental Panel on Climate Change (IPCC), “[a]verage Northern Hemisphere temperatures during the second half of the 20th century were very likely higher than during any other 50-year period in the last 500 years and likely the highest in at least the past 1300 years.”\(^2\) Additionally, eleven of the twelve years between 1995 and 2006 “rank among the twelve warmest years in the instrumental record of global surface temperature (since 1850).”\(^3\)

Although human activities are not the sole source of Green-House Gas (GHG) emissions which cause the global warming phenomenon, according to the IPCC, human-caused GHG emissions have globally increased a staggering seventy percent between 1970 and 2004.\(^4\) During the same years, Carbon Dioxide (CO\(_2\)) which is considered the most important anthropogenic

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\(^1\) Steven Ferrey, Auctioning the Building Blocks of Life: Carbon Auction, the Law, and Global Warming, 23 ND J. L. ETHICS & PUB POL’Y 317 322 (2009) [hereinafter Ferrey, Auctioning the Building Blocks of Life].


\(^3\) Id.

\(^4\) Id. at 36.
GHG increased by about eight percent. Unchecked growth will lead to doubling of global carbon levels by 2050. Regardless of the source of GHGs, scientists have predicted dire consequences for life on earth if the trend continues its unbridled growth. It is commonly held that global emission rates must be reduced by sixty to eighty percent of 1990 levels by 2050 in order to limit the increase in temperature to two degrees Centigrade. The two-degree limit is the maximum temperature increase scientists have set in order to stabilize CO₂ concentrations in the atmosphere. Scientists believe that the potential ramifications of an increase in temperature beyond the two degree limit will send the earth’s environment into “uncharted waters.” The projection is that the planet will plunge into a tail-spin of environmental uncertainties with unimaginable repercussions.

With consensus that climate change poses an immediate problem, the controversy has shifted to what to do about it. In order to slow the rate of global warming, significant policy changes are required at a global level for which there is currently no existing legal infrastructure. Existing regulations have not been effective in slowing the effects of climate change.

One powerful policy tool currently being explored in several markets is the implementation of a cap-and-trade system for the carbon regulation market. The cap-and-trade system...

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5 Id.
8 Id. at 964-965.
9 Id. at 965.
10 Id.
13 Young, Designing an Effective Cap-and-Trade, supra note 11, at 1383.
market scheme is a gilded policy tool which seems to provide varying degrees of incentives to all
players: politicians, national and international economists, industries, and the environmental
conservationists.\textsuperscript{14} After all, the United States claims that it has effectively implemented its Acid
Rain Program (ARP) based on the cap-and-trade model with far better than expected efficiency
in obtaining compliance.\textsuperscript{15} The main question is whether the ARP model can be effectively
applied to carbon emission control.

This paper explores why the Acid Rain Program (ARP) cap-and-trade scheme, by itself, falls short in achieving similar results for carbon emission control objectives. Toward that end, a comparison is made to analyze why the carbon market differs greatly from the acid rain market on certain essential elements, and how these differences can explain the expected differing outcomes of implementing the cap-and-trade scheme within the two problem domains.

The next section provides a brief overview of the ARP history, discussing whether global warming and acid rain pose similar challenges. A summary of ARP and its elements of success are presented next. The following sections examine whether the same tool used in regulating acid rain can be used to address the global warming problem. The essential elements examined include: the local versus global nature of the cap-and-trade implementation and monitoring, radically different sources of pollution, and target pollutants and different regulation cost structures in different markets. Lastly, other carbon emission reduction alternatives are briefly discussed.


\textsuperscript{15} ROBERT V. PERCIVAL ET AL., ENVTL. REGULATION LAW, SCIENCE, AND POLICY 154 (2010) [hereinafter PERCIVAL].
II. Acid Rain versus Global Warming: Comparing Apples and Oranges?

Prior to comparing the cap-and-trade market schemes for acid rain and global warming, we should examine the difference in public perception between these two environmental problems. The question is whether the damages caused by both are perceived as real dangers to human health and welfare. And, does this perception influence the political momentum rallied behind proposed regulations?

A. Differences in the Nature of Target Pollutants

GHG target pollutants are not as straightforward as acid rain pollutants. Sulfur dioxide (SO$_2$), the target pollutant for ARP’s cap-and-trade, is readily quantifiable and verifiable. This is not the case with GHG emissions as there are six different gases that are considered “the root of the climate change problem.” They are CO$_2$, methane (CH$_4$), nitrous oxide (N$_2$O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride. It is impossible to speculate whether the ARP “would have succeeded had more gases been involved.” Unlike acid rain pollutants which are produced from the burning of fossil fuel, GHGs emit from numerous sectors of human activity such as energy generation, farming, construction, industry, transportation, forestry, etc. The EPA proposes a simple approach of treating all six GHGs as a “class” since they share the two common properties of being “well-mixed” and “long-lived.” This may simplify the accounting and administration needed to implement the regulations; however, these gases all have varying degrees of stability and radiative properties making them difficult to bundle in order to measure their cumulative global effect.

17 Yelin-Kefer, Warming Up to an International Greenhouse Gas Market, supra note 6, at 248, 253.
18 Id. at 253.
19 Id. at 222.
21 Yelin-Kefer, Warming Up to an International Greenhouse Gas Market, supra note 6, at 248-252.
bundle all six in one regulated class may be counterproductive to achieving meaningful reductions in GHGs over time. This is because the more harmful GHGs in the long term could be traded for those that are less environmentally problematic GHGs.

Regardless of this discrepancy, the general understanding is that absent the greenhouse effect, CO\textsubscript{2}, the most prevalent of GHGs, would not be considered a pollutant. Also, it is the aggregate effect of the CO\textsubscript{2} that is damaging, and safe levels can only be attained when overall emission reductions occur throughout the U.S. and the rest of the world.\textsuperscript{22}

GHG emission control entails accounting for more chemicals and millions of more sources of emission than acid rain.\textsuperscript{23} Further, in the existing programs that address GHGs, there is not a uniform approach to how and which emissions to include.\textsuperscript{24} Selecting only one of the GHGs can lead to other problems such as leakage.\textsuperscript{25} Some analysts go so far as to state that in order to achieve long term effects on global warming, all six gases must be regulated.\textsuperscript{26} As a result, the magnitude and non-homogeneous nature of a GHG market may get in the way of global or even national trade. Therefore, the ARP cap-and-trade model may not be a suitable model for this regulatory scenario.

**B. Differences in the Damages**

When acid rain pollutants combine with precipitation, they damage buildings such as irreplaceable statutes and monuments, damage vegetation by entering surface waters, and kill aquatic animals.\textsuperscript{27} Additionally, the acid rain gases and fine particles are believed to cause

\textsuperscript{22} Avi-Yonah, Combating Global Climate Change, supra note 14, at 24.
\textsuperscript{23} Yelin-Kefer, Warming Up to an International Greenhouse Gas Market, supra note 6, at 243.
\textsuperscript{25} Yelin-Kefer, Warming Up to an International Greenhouse Gas Market, supra note 6, at 254.
\textsuperscript{26} Id.
\textsuperscript{27} Id. at 235.
premature deaths in humans from heart and lung diseases such as asthma and bronchitis.\textsuperscript{28} It was estimated that the ARP caused a reduction in premature deaths of more than 9,600 per year, reduced cases of chronic bronchitis by more than 14,500 per year and reduced damage to natural sources.\textsuperscript{29} With acid rain, the economic loss is imminent, visible and measurable: There are no positive outcomes; other than ironically, SO\textsubscript{2} counteracts some of the warming effects of CO\textsubscript{2}.\textsuperscript{30} Based on the 2003 report to Congress by the Office of Information and Regulatory Affairs, the benefit of the ARP program in 2003 was between 78.4 and 78.8 billion, and the cost of compliance was between 1.1 and 1.9 billion, at least a 40:1, and potentially a 70:1 benefit to cost ratio.\textsuperscript{31} Based on this evidence, ARP has been declared as having “the largest quantified human health benefits of any program instituted in the past 10 years.”\textsuperscript{32}

In the case of global warming, damages are not as readily visible or quantifiable, and they may seem elusive or speculative. Skepticism is encouraged by scientists’ own admissions of scientific uncertainties about global warming. In its 2007 Assessment Report, the IPCC used such ambiguous modifiers as “likely”, “moderately likely” and “very likely” to describe the future impacts of global warming.\textsuperscript{33} Due to data limitations and other factors, the specific damaging impacts of global warming cannot be quantified with certainty.\textsuperscript{34} The IPCC has called

\begin{thebibliography}{9}
\bibitem{29} PERCIVAL, supra note 15, at 610.
\bibitem{30} Yelin-Kefer, Warming Up to an International Greenhouse Gas Market, supra note 6, at 235.
\bibitem{32} PERCIVAL, supra note 15, at 610.
\bibitem{33} IPCC Fourth Synthesis Report, supra note 2, at 48.
\end{thebibliography}
for scientists to come up with more accurate forecasting models for their continued assessment of global warming.\textsuperscript{35}

Risk of irreparable damages according to the IPCC are determined to be anywhere from rising sea levels, loss of biodiversity, floods and droughts in certain parts of the world, to climate related illnesses and a decrease in agriculture that endangers human welfare.\textsuperscript{36} In their 2009 proposed rule, the EPA concluded that even under scenarios of high growth levels over time, CO\textsubscript{2} does not cause direct adverse health effects, and all public health risks would be due to climate change.\textsuperscript{37} Other sources confirm that adverse health effects are secondary impacts rather than direct impacts associated with substances traditionally labeled as pollutants such as SO\textsubscript{2}.\textsuperscript{38} While the varying degrees of uncertainty in the direct and indirect impacts of global warming are still the subject of heated scientific and political debates, the proven scientific facts undisputedly point to an increase in the global warming trend.\textsuperscript{39} The real challenge is no longer in proving that the global warming causes irreparable damage to the entire planet, rather, the challenge is in devising more accurate forecasts of the anticipated damages.\textsuperscript{40}

Accurate models bring higher confidence to the process of translating the risks into realistic economic and welfare costs which allow the governments to develop economically feasible and appropriate mitigation strategies. If the degree of confidence on the projection of damages is not high enough, the level and urgency of emission regulation will not be properly

\begin{itemize}
\item \textsuperscript{36} IPCC Fourth Synthesis Report, \textit{supra} note 2, at 48.
\item \textsuperscript{37} 74 Fed. Reg. 18886, 18889-18890 (2009).
\item \textsuperscript{38} McKinstry, \textit{The New Climate World}, \textit{supra} note 24, at 798.
\item \textsuperscript{39} Bryner, \textit{Reducing Greenhouse Gases Through Carbon Market}, \textit{supra} note 7, at 964.
\item \textsuperscript{40} IPCC Meeting on Climate Projection Models, \textit{supra} note 35, at 1.
\end{itemize}
balanced against the potential economic destabilization resulting from the implementation of the necessary regulation. For example, on the one hand, cap-and-trade is a softer type of regulation scheme and easier on the industry, but on the other hand, it is unpredictable as to the degree of cost-certainty. It also requires a longer lead time for implementation because of the infrastructure that needs to be set up first.\footnote{Avi-Yonah, \textit{Combating Global Climate Change}, supra note 14, at 6.} However, a carbon tax in contrast, is considered highly unpopular by industry as well as politicians, but has a high degree of cost-certainty. This carbon tax could be put in effect almost immediately if the level of urgency in protecting the health and well-being of the planet is deemed too high to afford further delay.\footnote{Id. at 35.} Currently, there is little specific and measurable data available on global warming-induced damages determined by the scientific community. The current forecast models are likely not reliable enough to be used to determine, with certainty, the appropriate level of regulatory stringency needed to control GHGs.

C. Differences in Political Atmosphere

When the Clean Air Act (CAA) Amendments, which included ARP, were proposed in 1990, President Bush and his top advisers were strong proponents of the program.\footnote{Bryant Walker Smith, \textit{Stakeholder Reaction to Emissions Trading in the United States, the European Union, and the Netherlands}, 25 J. LAND USE \& ENVTL. LAW 137 140 (2009) [hereinafter Smith, \textit{Stakeholder Reaction to Emissions Trading}].} Both houses of Congress passed the bill with approximately ninety percent approval.\footnote{Id.} The reception by industry was not as enthusiastic at first. The already highly regulated power generation industry assumed the program would be ineffective and would add another level of administrative burden to the cost of the command-and-control regime.\footnote{Id. at 140-141.} Eventually, the industry embraced the cap-
and-trade system when they began to view it more as a source of profit than a regulatory policy tool.\(^{46}\)

The global warming movement does not currently enjoy the same favorable political atmosphere today. Even though President Obama has voiced his strong support for the battle against global warming, the political arena is sharply polarized on this issue.\(^{47}\) Many politicians are under the impression that the global warming debate is a power struggle between industry and the government under the premise of environmental protection.\(^{48}\) Some view the projections by global warming models as political propaganda that tug at the public’s heart-strings.\(^{49}\)

Even though the tides are slowly turning in favor of seriously acting upon the myriad of proposed solutions to battle global warming, there is still a lack of appreciation for the increased level of urgency on behalf of the emitters as well as the general public.\(^{50}\) Even with the initial regulatee resistance to the program, ARP was never subjected to such a high degree of polarization and political skepticism.\(^{51}\) It is no secret that the political momentum necessary to remedy society’s environmental ailments can be more readily built to respond to the resulting visible economic losses and health risks that can be clearly tracked and quantified as affecting

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\(^{46}\) Id. at 142.


\(^{48}\) See e.g. ANDREW J. HOFFMAN AND MARC J. VENTRESCA, ORGANIZATIONS, POLICY AND THE NATURAL ENVIRONMENT, 179 (2002) (explaining how the lobbying efforts of the U.S. industries were successful by securing political allies in Congress leading to the failure of Kyoto Protocol ratification).

\(^{49}\) Around the time Kyoto Protocol was being hotly debated, public skepticism was further fueled by Vice President Gore spreading his global warming message as he flew in his private jet, completely missing the irony of leaving a huge carbon foot-print behind. He nevertheless, justified his carbon intensive lifestyle by claiming he buys carbon offsets. See Young, Designing an Effective Cap-and-Trade, supra note 11, at 1406; see also Peter Schweizer, Gore isn’t quite as green as he’s led the world to believe, http://www.usatoday.com/news/opinion/editorials/2006-08-09-gore-green_x.htm (last visited May 15, 2011); see also Global warming doco ‘political propaganda’, http://www.abc.net.au/news/stories/2007/07/13/1977504.htm (last visited May 15, 2011).

\(^{50}\) See Lydia Saad, Increased Number Think Global warming is exaggerated, Gallup (March 11, 2009) available at http://www.gallup.com/poll/116590/increased-number-think-global-warming-exaggerated.aspx (last visited May 15, 2011) (gallup poll on question of “global warming will pose a serious threat to you or your way of life in your lifetime?” had 38% say yes.)

\(^{51}\) Smith, Stakeholder Reaction to Emissions Trading, supra note 43, at 140.
them (i.e. cost-benefit analysis) as in the acid rain situation.\textsuperscript{52} In the case of global warming, the sheer amount of force needed to establish effective regulations in the face of the current political division is likely overwhelming.

D. Are there enough incentives for the international community to be motivated to mount a global regulatory movement?

Another inherent difference between acid rain and global warming is that countries like China and Russia actually benefit significantly from global warming.\textsuperscript{53} The reason is that they have vast areas of land that lay barren due to the extreme cold.\textsuperscript{54} These lands would become usable for purposes such as agriculture once the weather conditions improve. Specifically for China, the problem is made more complicated considering that the booming economy of China has recently made it the number one producer of GHG emissions in the world.\textsuperscript{55} Economically speaking, China does not have any incentives to motivate it to achieve any meaningful reductions in emissions, because they are not required to do so by any international agreements (e.g. the Kyoto Protocol exempts developing countries).

Another example of countries benefiting economically from global warming is Canada which now has the Northwestern Passages open due to the melting of the arctic ice allowing commercial vessels to navigate through. According to geology.com, this can save billions of dollars in transportation costs each year.\textsuperscript{56} If certain countries decide not to join in the fight against global warming, they can not only gain unfair market advantage because of the lower


\textsuperscript{53} Young, Designing an Effective Cap-and-Trade, supra note 11, at 1410.

\textsuperscript{54} See Vladimir Stolbovii, Agricultural Phytomass in 1990, International Institute for Applied Systems Analysis, Land Resources of Russia, http://www.iiasa.ac.at/Research/FOR/russia_cd/agr_des.htm (last visited May 15, 2011) (Russia’s agriculture is limited to 12% of territory due to cold and humid climate).


cost of production of goods, but they will also render the entire effort ineffective because of the global atmospheric nature of the GHG concentrations. This is why a global emissions market approach will probably be more economically palatable for the international community since the market benefits act like the proverbial carrot while violation sanctions are the proverbial stick.

Even for those countries who decide to participate in the global emissions market, the consensus requirement for any international infrastructure will make achieving any environmental benefits highly unlikely. This notion was readily apparent with the European Union (EU) Emissions Trading Scheme (ETS), a regulatory system for CO₂ emissions that was established pursuant to the Kyoto Protocol. The EU ETS track record is the closest available indicator of a multi-country cap-and-trade system experience at this time because it is currently considered the largest emissions trading scheme with twenty five participant countries and thousands of installations. While billions of dollars were traded in the EU ETS market in 2007, the EU emissions increased 1.1 percent under ETS instead of being reduced. In 2008 and 2009 ETS saw a reduction in emissions due to the economic recession, but in 2010 carbon emissions rose again by 1.8 percent according to Bloomberg New Energy Finance Report; however the total emissions are estimated to be fifteen percent lower than the 2007 emission levels. The overall drop can be misleading as it can mainly be attributed to a loss of productivity due to the

58 74 Fed. Reg. 18886, 18895 (2009); see also Avi-Yonah, *Combating Global Climate Change*, supra note 14, at 47.
recent economic recession. The same report predicts a continuing rise in the EU ETS emissions for the next few years, as the world economy continues its recovery from the recession.\textsuperscript{62}

\textbf{E. Moral Status of Market-based Pollution Trading}

The world is slowly moving towards a broader global awareness. In view of our proven contribution to global warming, carbon emission control is no doubt a moral imperative for all human beings. As the only member of earth species who can actively engage in the battle against global warming, human beings are obligated to explore the moral nature of their environmental choices through the four moral questions proposed by professor Judith Koons of “what is good?; what is fitting?; what is true?; and what is right?”\textsuperscript{63} How these questions are answered at the individual level, is left to each individual’s principles, level of awareness and conscience. In the case of governments and policies, however, the approach to controlling GHGs must be a concern for all nations both collectively and individually. As a policy tool, the cap-and-trade scheme can be put to the moral test above. At the collective level, the question of what is “good” refers to what would be the end result of applying this policy to a world market for GHGs on the planet environment. The question of what is “fitting” deals with whether the choice of cap-and-trade policy as a solution is an appropriate one, treating the planet species as interdependent members of earth community. What is “true” refers to our knowledge of the inner workings of this scheme based on experience and logic, and whether the weight of this knowledge warrants moral considerations. What is “right” is an inquiry into whether human beings have a duty in regards to controlling the global warming, and whether cap-and-trade tool warrants “just” action by taking the collective rights of species into consideration.\textsuperscript{64} For the U.S.

\textsuperscript{62} Id.
\textsuperscript{64} Id. at 265.
in particular, these questions must be explored in light of IPCC and Census’ data showing that
the U.S. is responsible for almost fifteen percent of world GHG emissions with approximately
4.5% of the world’s population.65

Aside from the obvious motive of enlightened self-interest and protection of future
generations, it is our moral obligation and duty to intervene as a country and take a lead role,
knowing that the future destruction of species that share our planet is inevitable. This
intervention will no doubt be inconsistent with the existing law and policy paradigms that
generally lack a global perspective.66 Based on the moral imperative, regardless of the economic
costs, we must respond to the problem to the best of our creative ability. This includes
examining where the cap-and-trade market scheme stands as far as moral status. Even though
applying Professor Koons’ four moral questions above may not lead everyone to a bright-line
determination, the cap-and-trade scheme as a whole does seem to “cross a moral threshold.”67
The market scheme is morally questionable because it leads to commoditizing the GHGs, and
encouraging what should be discouraged while it generates wind-fall profits for industry.68

It is not just the existing law and policy archetypes that dictate a narrow social
perspective, tying our collective conscience into a knot. The reality of today’s competitive,
“bottom-line” industries is that even the enlightened self interest perspective is rarely on the
business world radar, let alone considerations of a global social view. Some believe that there
have to be more than just morals arguments to motivate the industry giants and squabbling
governments to act. This is where the attractiveness of cap-and-trade incentives comes into play.
Some may consider cap-and-trade as an effective “morally neutral” means to achieve a moral

66 Koons, Earth Jurisprudence, supra note 63, at 282-283.
67 John M. Volkman, Making Changes in a New Currency: Incentives and the Carbon Economy, 29 PUB. LAND &
68 Id. at 8.
end. The question is whether using the cap-and-trade scheme would be an ethical compromise in the battle against global warming or a reasonably pragmatic start. While it is true that the sources of carbon offsets could be “reductions, sequestration, and avoidance of GHG emissions from uncontrolled sources”; in practice, cap-and-trade is known to be prone to manipulation to the point that true reductions are dodged. In general, the appeal of creating a commodity out of carbon emissions and being given the opportunity to improve the bottom-line by trading carbon offsets is hard to resist for the carbon emitters. After all, they are already emitting the carbon, so why not profit further from it?

III. The Acid Rain Program: The Flagship of Cap-and-Trade Systems

Although there are numerous cap-and-trade programs currently in existence, the most well known one in the U.S. is the EPA’s Acid Rain Program. Economists have labeled the program “the greatest green success story of the decade,” and EPA has published a guide for countries interested in learning about the ARP system. Several other domestic and regional cap-and-trade proposals are based on ARP’s cap-and-trade scheme. The Kyoto Protocol used the ARP’s cap-and-trade mechanism because of the success of the program in the U.S. The incentives provided by Kyoto Protocol brought about the establishment of several tradable permit systems in the EU and several individual European countries.

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70 See e.g. Ferrey, Auctioning the Building Blocks of Life, supra note 1, at 356 (noting the abuse of CDM projects in developing countries to increase domestic available emissions).
71 Young, Designing an Effective Cap-and-Trade, supra note 11, at 1396.
72 Smith, Stakeholder Reaction to Emissions Trading, supra note 43, at 145.
73 Id.
74 Young, Designing an Effective Cap-and-Trade, supra note 11, at 1396.
A. Cap-and-Trade Key Characteristics

Simply put, a cap-and-trade system limits pollution to preset limits (i.e. the cap) and distributes the tradable right to pollute to those who are subject to regulation below the cap. A basic cap-and-trade system is set up by taking the following actions:

1- Baselines are set and emission caps are established.
2- Allowances are either freely distributed or auctioned off.
3- An allowance trading scheme is set up including a monitoring plan to verify compliance and prevent cheating.
4- If international allowance trading is allowed, an international monitoring system will need to be established requiring international cooperation and enforcement of sanctions.
5- “Safety valve” provisions may need to be set up for banking and borrowing allowances to make up for a lack of cost-certainty in the cap-and-trade-system.
6- Additionally, offsets should be made available for activities such as sequestration and renewable energy generation.
7- Finally, there is the crucial matter of accountability which according to the EPA is a critical factor in the success of any cap-and-trade program.

B. ARP’s Cap-and-Trade Mechanism

The cap-and-trade mechanism under Title IV of the 1990 CAA, was considered as an innovative and controversial approach because it assigned to power generation companies certain emission allowances subject to an overall emissions cap while leaving the emitters free to choose abatement or allowance trading based on their own business decisions. Title IV was implemented in two phases: Phase I occurred from 1995 to 2000 and included only 110 power plants. Phase II started in 2000 and it included almost all power generating units in the United States. There was significant over-compliance in Phase I of the program execution. Millions

76 Young, Designing an Effective Cap-and-Trade, supra note 11, at 1395.
81 Id. at 128.
of allowances (i.e. millions of tons of \( \text{SO}_2 \) emissions) were banked by the power plants prior to the beginning of Phase II.\(^{83}\) The cap remained constant in the transition to Phase II while the number of sources greatly increased.\(^{84}\) The ownership of allowances is managed by the EPA using an Allowance Trading System.\(^{85}\) All power generating firms are required to report to the EPA all their allowance transfers.\(^{86}\) At the end of the year, used allowances are retired by the EPA.\(^{87}\) The Phase II market was more robust as there were significantly more participants and the participants gained more confidence by engaging actively in the allowance trading market.\(^{88}\) The APR cap-and-trade also employed strict sanctions for noncompliance including substantial penalties, forfeiture of future allowances to cover the shortage, and in the worst cases “forfeiture of the right to participate in the program.”\(^{89}\)

C. ARP Implementation, Administration, Monitoring and Enforcement

ARP’s allocation of allowances was based on statute and formulas dependant on average fuel consumption during baseline years and a fixed emission rate constant.\(^{90}\) Under the ARP, the EPA required power plants to install special monitors that produce accurate data on actual emissions,\(^{91}\) then there was a continuous monitoring requirement with stringent penalties for violators.\(^{92}\) The EPA not only ensured effective monitoring measures were in place, but it was and is the sole authority and administrative body that manages and tracks all transactions and

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\(^{82}\) Id.
\(^{83}\) Id.
\(^{84}\) Id.
\(^{85}\) Id. at 129.
\(^{86}\) Id.
\(^{87}\) Id.
\(^{88}\) Id.
\(^{89}\) Smith, Stakeholder Reaction to Emissions Trading, supra note 43, at 144.
\(^{90}\) Tietenberg, Tradable Permits in Principle and Practice, supra note 75, at 257.
\(^{91}\) Lesley K. McAllister, The Overallocation Problem In Cap-And-Trade: Moving Toward Stringency, 34 COLUM. J. ENVTL. L. 395 399 (2009) [hereinafter McAllister, The Overallocation Problem In Cap-And-Trade].
\(^{92}\) PERCIVAL, supra note 15, at 606.
yearly reconciliations. Because of strict EPA supervision, ARP’s enforcement of compliance is highly effective, and the high cost of non-compliance is most likely a significant deterrent. According to the EPA, the ARP had a hundred percent compliance rate in 2009.

D. The Results of ARP’s Cap-and-Trade System

Many commentators believe that ARP’s cap-and-trade regulatory scheme was an overwhelming success both in terms of environmental impact and that it occurred without significant economic distress. While it is true that ARP’s cap-and-trade is regarded as a success, the program is limited in geography and emission reductions. Additionally, there are no nationwide examples of cap-and-trade systems that affect multi-sector activities. Even though acid rain legislative goals have been achieved, acid rain has continued to persist, and many ecosystems still suffer from the effects of SO2 pollution. The fixed legislative goals in ARP have created barriers to additional necessary federal and state actions to further remedy the continuing problem. Some analysts believe that the success of ARP is mainly due to the use of low sulfur coal (initially brought about by railway deregulation), a shift from oil to natural gas, and the use of scrubbers. All of these changes had no significant connection with the application of cap-and-trade as a regulatory scheme; some just happened to coincide with the ARP implementation. Finally, the ARP cap-and-trade program did not result in any significant

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94 Tietenberg, Tradable Permits in Principle and Practice, supra note 75, at 257.
95 See http://www.epa.gov/airmarkets/progress/ARP09_2.html (last visited May 15, 2011).
96 Avi-Yonah, Combating Global Climate Change, supra note 14, at 34.
97 Ferrey, Auctioning the Building Blocks of Life, supra note 1, at 366.
99 Id.
100 Ferrey, Auctioning the Building Blocks of Life, supra note 1, at 366; see also McAllister, The Overallocation Problem In Cap-And-Trade, supra note 90, at 413.
101 Smith, Stakeholder Reaction to Emissions Trading, supra note 43, at 145.
technological innovation or a switch to renewable energy sources.\textsuperscript{102} The general consensus is not only that cap-and-trade does not encourage innovation; it actually stifles significant innovation by allowing companies to take the minimum necessary actions in order to continue to benefit from the relative status quo;\textsuperscript{103} meanwhile, the underlying environmental problem persists.

E. Comparing ARP Cap-and-Trade with EU ETS

Based on the highly publicized apparent success of APR, legislative proposals in the U.S. during 2009\textsuperscript{104} and 2010\textsuperscript{105} continued to rely upon a cap-and-trade program as the primary mechanism for directly reducing GHGs.\textsuperscript{106} This trend demonstrates the general tendency toward cap-and-trade coupled with the irresistible free allocation of allowances has become popular among politicians.\textsuperscript{107} On its face, this scheme arms the politicians with more power over regulated industries while it keeps the industries highly motivated to comply with regulations. The free distribution is deemed especially important because it aids in building the political backing needed to implement a new regulatory scheme.\textsuperscript{108} Incidentally, this creates the political symptom of causing cap-and-trade schemes to be prone to initial over-allocation problems as was the case with both ARP and ETS.\textsuperscript{109} Additionally, while the cap-and-trade system seems to promise fixed reductions in carbon dioxide emissions, the tradeoff is uncertainty about the price

\textsuperscript{102} Ferrey, \textit{When 1 + 1 No Longer Equals 2}, supra note 60, at 650.
\textsuperscript{104} American Clean Energy and Security Act (Waxman-Markey), H.R. 2454, 111th Cong. (2009) \textit{available at} http://www.govtrack.us/congress/bill.xpd?bill=h111-2454 – e.g. Title VII, Sec 701(b)(2).
\textsuperscript{106} Kaswan, \textit{Decentralizing Cap-and-Trade}, supra note 69, at 345.
\textsuperscript{107} Another allowance distribution method is by auction; this method lacks the political incentives. Both ARP and Kyoto Protocol did not take the route of auctioning initial allowances. \textit{Id.} at 379 (Stating that cap-and-trade using auctioning allowances will cause a massive increase of revenue for the government agencies and a significant increase in the price of electricity and other commodities).
\textsuperscript{108} Tietenberg, \textit{ Tradable Permits in Principle and Practice}, supra note 75, at 254.
of those reductions. The promise may be easily uprooted if the price of carbon rises too high. A high carbon price will lead to increased political pressure for politicians to soften the carbon cap, thus removing the targeted environmental benefits of the cap-and-trade system.\textsuperscript{110}

While the political consensus-building potential of the cap-and-trade program with free allocations is readily apparent, the scope of the system and number of players may greatly impact the consensus-building promise of the scheme. Applying it only to the energy sector in one country makes the ARP system much less complex than the scheme needed in regulation of GHGs. The GHG market potentially includes billions of sources and various chemicals impacting almost every sector of the economy in all countries of the world.\textsuperscript{111} A major cap-and-trade challenge for the international market, the need to build international cooperation, was not present in the scope of the ARP’s cap-and-trade system. This obviously simplified matters to a great extent for adoption of the ARP cap-and-trade model. Additionally, the ARP market is comprised of utility generation companies who historically had already been among “the most heavily regulated groups of companies in the United States.”\textsuperscript{112} In contrast, a great percentage of the carbon emitters have not been historically regulated to the same level of scrutiny.\textsuperscript{113} The enormous size of the world market for carbon is said to “approximate the world market for all sweet crude oil sales.”\textsuperscript{114} No system in the United States or the rest of the world has had any meaningful experience with economy wide cap-and-trade systems at this scale as of yet.\textsuperscript{115} Additionally, the scope and complexity of the market varies based on the choice of GHGs to be capped and the sectors to be regulated.\textsuperscript{116} Some experts believe that in order for a meaningful

\begin{thebibliography}{9}
\bibitem{110} Avi-Yonah, \textit{Combating Global Climate Change}, supra note 14, at 6.
\bibitem{111} Ferrey, \textit{Auctioning the Building Blocks of Life}, supra note 1, at 365.
\bibitem{112} Kreutzer, \textit{Cap and Trade}, supra note 79, at 130.
\bibitem{113} See \textit{Id}.
\bibitem{114} Ferrey, \textit{Auctioning the Building Blocks of Life}, supra note 1, at 320.
\bibitem{115} Avi-Yonah, \textit{Combating Global Climate Change}, supra note 14, at 34.
\bibitem{116} Young, \textit{Designing an Effective Cap-and-Trade}, supra note 11, at 1402.
\end{thebibliography}
and long term solution to be facilitated, all six GHGs should be regulated. In short, the challenges relating to the massive size of the world market gives rise to “equity concerns, coordination problems, and monitoring and enforcement difficulties.”

A glaring environmental problem in cap-and-trade which is cloaked as an incentive to the emitters, is that participant firms (in regional applications) or countries (in international applications) can purchase credits in order to avoid reducing emissions resulting in little or no benefit for the underlying environmental issue. This was made amply apparent by the dismal results of ETS in achieving any environmental benefits since its launch in January 2005.

In addition, ARP’s apparent success is at least partially accredited to the EPA’s recognized enforcement authority and harsh penalties for violators. In the global market, quotas expected to be made on the basis of consensus foster an extensive over-allocation of initial allowances and there is no competent global regulating body to normalize the allocation effort or provide effective enforcement. In spite of all the potentially attractive political and market advantages, being environmentally ineffective is the main negative result of this regulation scheme.

F. Kyoto Protocol and EU ETS

The Kyoto Protocol is the first international agreement targeting GHG reductions. It was ratified by 141 nations setting reduction targets on GHGs for thirty seven countries until 2012, and it went into force in 2005. Many economists have been highly critical of the Kyoto Protocol and EU ETS.
Protocol. They say that due to its deficiencies, it will be ineffective and costly for the little it accomplishes.\footnote{Robert N. Stavins, \textit{A Meaningful U.S. Cap-and-Trade System to Address Climate Change}, 32 HARV. ENVTL. L. REV. 293 294 (2008) [hereinafter Stavins, \textit{A Meaningful U.S. Cap-and-Trade System to Address Climate Change}].}

The most comprehensive cap-and-trade program developed pursuant to the Kyoto Protocol is the cap-and-trade system implemented through ETS by the EU that covers 11,000 installations in 25 countries.\footnote{Peretz, \textit{Carbon Leakage Under the European Union Emissions Trading Scheme}, supra note 57, at 59-60.} Although this system has failed to reduce emissions, other governments, including the United States, are striving to rely mainly on this method for reducing carbon emissions.\footnote{Avi-Yonah, \textit{Combating Global Climate Change}, supra note 14, at 35.} The World Bank has indicated that the EU ETS traded $50 billion in allowances and derivative contracts in 2007.\footnote{Peretz, \textit{Carbon Leakage Under the European Union Emissions Trading Scheme}, supra note 57, at 60.} The Carbon Markets and Investment Association (CMIA) working to reduce emissions using the market mechanisms of the United Nations Framework Convention on Climate Change (UNFCCC) estimates a trillion dollar impact for the carbon market by 2020.\footnote{Public Inputs on Programme of Activities (POA): http://cdm.unfccc.int/public_inputs/2008/PoA/cfi/KK02WM6FG5J2M3NBMM9M24R6XGMPFR (last visited May 15, 2011).} It seems that the ETS global carbon market is lively while no significant environmental goals are being achieved, because politicians created so many free allowances.\footnote{Avi-Yonah, \textit{Combating Global Climate Change}, supra note 14, at 42.}

\textbf{G. Implementation Challenges}

Implementing the infrastructure for a cap-and-trade system requires a long lead time. Some projects show that once cap-and-trade legislation passes, it takes several years before the system is effectively functional.\footnote{\textit{Id.}, at 6.} Even when the system is operational, the effectiveness of it is directly related to the setting of appropriate baselines for emission reduction targets.\footnote{\textit{Id.}} Also,
there is uncertainty about the price of emission reductions. If the price of carbon climbs too high, inevitably, there will be political pressure rationalizing and pushing for raising the cap.\(^\text{132}\) Clearly, this scenario would make the cap-and-trade quite ineffective in addressing the primary goal of the system which is achieving fixed reductions in carbon emissions.

It is imperative for the cap-and-trade system to establish appropriate baselines for allowance distribution. Some experts believe setting appropriate allowance baselines will be unwieldy and complex.\(^\text{133}\) The resulting initial allocation is believed to be the most controversial aspect of cap-and-trade systems.\(^\text{134}\) There is also the question of utilizing the correct method for establishing a cap. Business logic dictates that lowering the cap on emissions is limited by the participant’s cost of compliance.\(^\text{135}\) These limitations can prevent Congress from passing stringent laws needed to safeguard the environment.\(^\text{136}\) From the perspective of environmental protection, setting the cap low enough is probably the key factor in the success of the cap-and-trade program.\(^\text{137}\) However, there is little information available on how the GHG cap is calculated. Most of the difficulties in the administration of the GHG cap-and-trade program are due to the scheme being basically a scaled up version of the ARP’s cap-and-trade program without taking into consideration the challenges of national or international implementation. Significant changes to the international laws and establishment of international regulating bodies are needed to apply the program more broadly.\(^\text{138}\) The challenges with addressing the administration and implementation of what necessarily must be a much broader program leads

\(^{132}\) Id.
\(^{133}\) Id. at 33.
\(^{134}\) Id. at 269.
\(^{135}\) Kreutzer, Cap and Trade, supra note 79, at 134.
\(^{136}\) Id.
\(^{137}\) McAllister, The Overallocation Problem In Cap-And-Trade, supra note 90, at 397.
\(^{138}\) Young, Designing an Effective Cap-and-Trade, supra note 11, at 1400.
directly to timing concerns for implementing cap-and-trade versus some other method like taxation that can begin almost immediately. 139

H. Monitoring, Verification and Enforcement Challenges

There is a gap in clear direction for the monitoring, verification and enforcement of a global GHG cap-and-trade scheme. For the cap-and-trade system to be effective, it is essential that each regulatee provides accurate accounting of the emissions within the specified compliance period. 140 Who should monitor and verify the emissions, and who should enforce the standards? According to experts, these three steps would be made even more complicated if all six GHGs are involved, and the result would potentially be an “accounting nightmare.” 141 For example, methane has high short-term global warming potential; it is relatively minor over the long term in comparison to the long term disastrous effects of CO2. 142 Giving all six GHGs the same weight in cap-and-trade accounting may be the easy way out, but it overlooks the individual role of each GHG in contributing to global warming, since the comparative radiative potentials among the six gases are not negligibly different. 143 In addition to the fact that some experts believe that non-CO2 measurement of GHGs is difficult, 144 scientists generally agree that among the six gases, CO2 is the most important GHG because it is the “single largest anthropogenic contributor to global warming.” 145

139 Id. at 39.
141 Yelin-Kefer, Warming Up to an International Greenhouse Gas Market, supra note 6, at 249.
142 Id. at 249.
143 Id. at 250.
144 Id. at 1203 (direct method is costly - the electricity generation sector which is responsible for 40% of CO2 emission generates high quality data under ARP; however, many GHG emissions that are likely to be included in the cap-and-trade are not measured. Non-CO2 measurement of GHGs are difficult).
Self monitoring and reporting may be beneficial because it internalizes the cost of these activities; but the downside is that the data is suspect. Self-reporters are likely to underreport or become lax.\textsuperscript{146} Opponents of cap-and-trade systems maintain that monitoring the system is as hard as determining an accurate measurement of GHGs.\textsuperscript{147} Verification of GHG emission reductions is challenged by being overly bureaucratic and extremely subjective.\textsuperscript{148} Indeed, some predict that the bureaucratic system that needs to be set up to address the monitoring, verification and enforcement activities would be cost prohibitive.\textsuperscript{149} The Kyoto Protocol’s verification scheme seems especially unworkable as it is conducted through delegations.\textsuperscript{150} A third party verification will likely pose significant practical and legal issues due to introducing an additional actor into the process.\textsuperscript{151} Also, weak enforcement would render the system ineffective, erode public confidence, and affect incentives for market participants as a result.\textsuperscript{152} If safeguards are not properly placed, a cap-and-trade scheme creates ample opportunities for fraud.\textsuperscript{153} It can lead to corruption and manipulation.\textsuperscript{154} For these reasons, some American commentators believe there is a need for U.S. to step up to the plate and assume leadership in the enforcement of global GHG emission reduction to make cap-and-trade workable.\textsuperscript{155}

I. Legislative Vehicle to Address GHGs

In \textit{Massachusetts v. EPA},\textsuperscript{156} in a narrow five-to-four victory, the Supreme Court held that the broad definition of “air pollutant” in the statutory text of the CAA includes CO\textsubscript{2}.\textsuperscript{157} The

\begin{thebibliography}{99}
\bibitem{146} Id. at 1209.
\bibitem{147} Young, \textit{Designing an Effective Cap-and-Trade}, supra note 11, at 1409.
\bibitem{148} Ferrey, \textit{When 1 + 1 No Longer Equals 2}, supra note 60, at 651.
\bibitem{149} Stavins, \textit{A Meaningful U.S. Cap-and-Trade System to Address Climate Change}, supra note 124, at 296.
\bibitem{150} Driesen, \textit{Linkage and Multilevel Governance}, supra note 103, at 393.
\bibitem{151} McAllister, \textit{The Enforcement Challenge of Cap-and-Trade Regulation}, supra note 140, at 1228-1229.
\bibitem{152} Id. at 1199.
\bibitem{153} Id. Also see Driesen, \textit{Linkage and Multilevel Governance}, supra note 101, at 397.
\bibitem{154} Young, \textit{Designing an Effective Cap-and-Trade}, supra note 11, at 1400.
\bibitem{155} Id. at 1409.
\bibitem{156} Mass. v. EPA, 549 U.S. 497 (2007).
\end{thebibliography}
Supreme Court further established that the EPA has statutory authority to address GHG regulation. The court required the EPA to form a judgment based on available scientific information as to whether GHG emissions contribute to climate change in an endangerment determination as per CAA §202. The court added that the “EPA can avoid taking further action only if it determines that greenhouse gases do not contribute to climate change or if it provides some reasonable explanation as to why it cannot or will not exercise its discretion to determine whether they do.”

In its response to the remand in Massachusetts, the EPA issued an Advance Notice of Proposed Ruling (ANPR). Although the ANPR was filled with a wealth of scientific reports and analyses in addition to a discussion of legal options, it did not include an endangerment finding. After the change in administrations in 2009, however, the EPA finally issued the endangerment finding. The EPA finding confirmed that the six GHGs constitute air pollution that threatens public health and welfare. The EPA also responded in the positive to whether GHG emissions from motor vehicles contribute to the threat of global warming. Although the EPA action does not impose any requirements on the industry, it establishes the EPA’s dominion over the GHG regulation arena based on the Supreme Court’s ruling in Massachusetts. However, the EPA needs to adopt new legislation to address GHGs, because the CAA does not offer a statutory foundation well suited to address the complexities related to GHG emissions

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157 Id. at 532 (establishing EPA as the agency responsible for GHG pollution and emission reduction under CAA).
158 Id.
159 Id. at 533.
160 Id.
161 PERCIVAL, supra note 15, at 546.
162 Id. at 547.
164 Id.
Current CAA legislative models with fixed legislative goals such as ARP do not provide the needed flexibility to adjust goals or policies as more scientific data becomes available.\textsuperscript{166}

\textbf{J. Which Sectors Get Capped?}

The bulk of CO\textsubscript{2} emissions are from energy generation, transportation and industrial sources, and the remaining are from agricultural, commercial and household sources (unlike ARP where the worst SO\textsubscript{2} emitters were easily identified in Phase I and later included all energy industry SO\textsubscript{2} emitters in Phase II).\textsuperscript{167} In general, the GHG emitters are not concentrated in a single sector. The current regulatory proposals mainly address industrial emitters, so the regulations may end up ignoring transportation and household emissions which contribute almost one-third of U.S. carbon emissions.\textsuperscript{168}

There are also other sectors that are not currently addressed such as the ongoing tropical deforestation which is responsible for approximately twenty percent of global emissions.\textsuperscript{169} Another estimate is that twenty eight percent of GHG emissions are generated by vehicle operations.\textsuperscript{170} Cap-and-trade is not easily applicable to these sectors as it is not practicable to require every owner to buy carbon offsets.\textsuperscript{171} Further, vehicle manufacturers may also claim that the individual owner’s vehicle emissions lie outside the manufacturers’ area of responsibility as

\begin{footnotesize}
\begin{itemize}
  \item \textsuperscript{165} Civins, \textit{Environmental Due Diligence}, supra note 145, at 41.
  \item \textsuperscript{166} McKinstry, \textit{The New Climate World}, supra note 24, at 774.
  \item \textsuperscript{167} Bryner, \textit{Reducing Greenhouse Gases Through Carbon Market}, supra note 7, at 966 (GHG emission percentages based on EPA’s data).
  \item \textsuperscript{168} Young, \textit{Designing an Effective Cap-and-Trade}, supra note 11, at 1402.
  \item \textsuperscript{169} Id. at 1406.
  \item \textsuperscript{170} Bryner, \textit{Reducing Greenhouse Gases Through Carbon Market}, supra note 7, at 966.
  \item \textsuperscript{171} David M. Driesen and Amy Sinden, \textit{The Missing Instrument: Dirty Input Limits}, 33 HARV. ENVTL. L. REV. 65 80 (2009).
\end{itemize}
\end{footnotesize}
the emissions are not generated from the manufacturing plants.\textsuperscript{172} As a result, the major mobile source of carbon emission would be left unregulated under cap-and-trade regulation.

K. Carbon Market Barriers

As explained above, establishing any trading scheme is further complicated by the variety of GHGs;\textsuperscript{173} however, even without the variety of GHGs, there are still significant challenges to be addressed. These challenges pose market barriers to a CO\textsubscript{2} market.

The cap-and-trade market rewards polluters who select the least costly choice between two technologies to reduce emissions. The least cost avoidance measure may not be the best choice for society. For example, a business might implement an end-of-pipe technology because it is cheaper than investing in solar energy technology. The business makes more profit selling the offsets from the end-of-pipe technology, because it obtains these extra allowances more cheaply. However, if the same business chose solar energy technology, although more costly, it would be a more beneficial long term option for society because it eliminates reliance on fossil fuels by replacing it with a renewable energy source. One of the major downsides of cap-and-trade is that the role of renewable energy as an alternative is not effectively supported.\textsuperscript{174}

Under the Kyoto Protocol, end-of-pipe approaches have generated the lion’s share of credits available in the market, because the emitters recognized they can benefit from the market without making significant changes to their fossil fuel-based technologies.\textsuperscript{175} GHG emission reduction necessarily requires decreasing fossil fuel-based energy demands which can only be

\begin{itemize}
\item \textsuperscript{172} \textit{Id.}
\item \textsuperscript{174} Ferrey, \textit{When 1 + 1 No Longer Equals 2}, supra note 60, at 594.
\item \textsuperscript{175} \textit{Id.} at 40 (under Kyoto Protocol, end-of-pipe approaches have generated the lion’s share of credits available in the market).
\end{itemize}
achieved through innovation and green building.\textsuperscript{176} If the emitting companies are not properly motivated to use these mechanisms to decrease energy demands, they will pass on the cost of emissions to the end-users. Ultimately, their lack of participation in promoting innovation to reduce GHGs will not affect their bottom-line because unlike ARP, the rise in cost of energy will not be shouldered by the emitters.\textsuperscript{177} The costs will directly transfer to the consumers instead.

L. Problem of Leakage

Leakage occurs when reduction of emissions in one place causes emissions production to increase in another place.\textsuperscript{178} This can happen when companies eager to take advantage of the cap-and-trade incentives move their operations elsewhere.\textsuperscript{179} In a recent survey, it was revealed that seventeen percent of EU ETS market participants considered relocating to less regulated countries due to the imposed cap.\textsuperscript{180} One of the potential impacts of the leakage is that the same company may use dirtier production processes in a less regulated country, effectively producing even greater amounts of GHGs as a result of relocation.\textsuperscript{181} The produced goods then would need to be shipped back to the EU, adding more emissions from transportation that would otherwise not be generated.\textsuperscript{182} Some experts have warned that “carbon leakage is already happening.”\textsuperscript{183}

Issues of equity go hand-in-hand with leakage. China, who is currently the largest emitter of GHGs, claims the status of a developing country.\textsuperscript{184} That status affords China and other developing countries such as India an economically advantageous position, because under

\textsuperscript{177} \textit{Id.}
\textsuperscript{179} \textit{Id.}
\textsuperscript{180} \textit{Id.}
\textsuperscript{181} \textit{Id.} at 61.
\textsuperscript{182} \textit{Id.}
\textsuperscript{183} \textit{Id.}
the Kyoto Protocol their emissions are unconstrained. In a hypothetical U.S. national cap-and-trade scenario for GHGs, leakage from out-of-state high carbon sources would also be prone to raise Constitutional issues\textsuperscript{185} such as Dormant Commerce Clause challenges.\textsuperscript{186} These potential legal implications have kept ARP leakage in check by preventing individual state abuses, but no similar international mechanism would keep member nations in check unless the G-8, UNFCCC, World Bank or other international entities could impose meaningful sanctions.

**M. Cap-and-Trade Does Not Promote Innovation**

The simple answer to why innovation is not favored in carbon trading markets is that the industry favors near-term efficiency over the higher cost of strategic sustainability.\textsuperscript{187} The main environmental innovation seen with the cap-and-trade scheme, for example, is limited to installation of scrubbers. This is technology that actually prolongs the life of conventional, fossil-fuel intensive facilities. For instance, it may be more economical to buy carbon offsets rather than change to cleaner technology. As a side effect, emissions trading fosters insufficient investment in environmental innovation because there is little incentive to do so.\textsuperscript{188} A related problem is that carbon offsets are not being provided to renewable power investments since no emission reduction takes place at these clean power sites.\textsuperscript{189} In essence, the offset scheme creates no economic incentive to pursue new renewable energy investments. In the conventional command and control regulatory system, innovation is demanded by setting stringent performance standards. In carbon markets, the stringent performance standards no longer exist, and as a result, economic incentives are needed to stimulate investments in innovations for

\textsuperscript{185} Ferrey, \textit{Auctioning the Building Blocks of Life}, supra note 1, at 320.
\textsuperscript{186} \textit{Id.} at 361.
\textsuperscript{187} Driesen, \textit{Shotgun Wedding}, supra note 173, at 51.
\textsuperscript{188} \textit{Id.} at 52.
\textsuperscript{189} Ferrey, \textit{Auctioning the Building Blocks of Life}, supra note 1, at 320.
alternative and renewable energy.\textsuperscript{190} Although theoretically speaking, market based schemes should be able to spur innovation by development of alternative technologies, with the industry’s technological and economic inertia, it may be a “leap of faith” to rely solely on market forces to deliver the level of innovation needed to respond to the crisis of global warming.\textsuperscript{191}

\textbf{N. Major Domestic and International Carbon Cap-and-Trade Programs}

There are several national and local programs and one international program that address GHGs.\textsuperscript{192} None of the several carbon cap-and-trade systems in existence have been recognized as a success; the EU ETS effort specifically is considered a failure.\textsuperscript{193} In the U.S., California is at the forefront of regional emissions trading markets, but a study has shown that seventy two percent of California voters believe that the state is on the wrong track with the carbon market, because it has caused higher than expected energy costs to be passed along to the consumers.\textsuperscript{194} If implemented on a national level, according to a forecast by National Association of Manufacturers, a federal cap-and-trade system would increase the price of all commodities; gasoline prices would increase by 60-144 percent; electric prices by 77-129 percent; it would eliminate three to four million jobs; and, it would reduce GDP by half a trillion dollars.\textsuperscript{195}

\textbf{IV. Alternative Carbon Emission Control Schemes}

Due to the nature of the GHGs as a global environmental issue, even if the U.S. sets up a strict cap-and-trade system, so long as China and India continue on their present track of increasing GHG emissions, there will be no certainty in achieving environmental benefits.\textsuperscript{196} Therefore, even if cap-and-trade is implemented as a central solution to global warming, other

\textsuperscript{190} Driesen, \textit{Shotgun Wedding}, supra note 173, at 53.
\textsuperscript{191} Avi-Yonah, \textit{Combating Global Climate Change}, supra note 14, at 29-30.
\textsuperscript{192} Civins, \textit{Environmental Due Diligence}, supra note 145, at 37.
\textsuperscript{193} Young, \textit{Designing an Effective Cap-and-Trade}, supra note 11, at 1402; also see Avi-Yonah, \textit{Combating Global Climate Change}, supra note 14, at 35, 49.
\textsuperscript{194} Ferrey, \textit{Auctioning the Building Blocks of Life}, supra note 1, at 372.
\textsuperscript{195} \textit{Id.}, at 374.
\textsuperscript{196} Avi-Yonah, \textit{Combating Global Climate Change}, supra note 14, at 47.
alternatives should be considered and used to fortify the regulatory framework in order to realize the environmental goals. The most obvious alternative to cap-and-trade is a traditional command-and-control scheme.197 This option provides significantly less flexibility to the industry regarding the amount and methods of emissions reduction, and it also has a much greater economic impact on the industry than the market-based approaches.198 Command-and-control requires uniform restrictions across emission sources and usually mandates specific control technologies.199 However, this alternative maybe a good fit for certain highly regulated sectors.

Many experts consider a carbon tax “the most effective method of reducing CO$_2$ emissions.”200 The Congressional Budget Office (CBO) released a study in 2008 in which the result of their analysis lends the strongest support to the tax scheme:

A tax on emissions would be the most efficient incentive-based option for reducing emissions and could be relatively easy to implement. If it was coordinated among major emitting countries, it would help minimize the cost of achieving a global target for emissions by providing consistent incentives for reducing emissions around the world. If other major nations used cap-and-trade programs rather than taxes on emissions, a U.S. tax could still provide roughly comparable incentives for emission reductions if the tax rate each year was set to equal the expected price of allowances under those programs.201

A carbon tax is an alternative which has been successfully implemented in a growing number of European countries, but their long-term results are not yet clearly established.202

Some experts have proposed a variety of economic incentive systems (EIS) to encourage the industry to reduce emissions. For example, the government could provide pure subsidies to

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197 Stavins, A Meaningful U.S. Cap-and-Trade System to Address Climate Change, supra note 124, at 297.
198 Id.
200 Avi-Yonah, Combating Global Climate Change, supra note 14, at 34.
202 Avi-Yonah, Combating Global Climate Change, supra note 14, at 34.
polluters to reduce their CO₂ emissions. In this scheme, the polluters are given a chance to bid for a given volume of reduced emissions, and the lowest bidder wins the subsidy. This system requires establishment of a baseline prior to subsidization which is extremely difficult to verify and maintain. There is also the ethical problem of paying the polluters not to pollute; leading down to a path plagued with potential fraud and gaming of the system with no real environmental benefits achieved.

Sequestration is another way to augment the battle with global warming. It includes efforts by carbon intensive industries to capture and remove the CO₂ emissions after production. Current technologies are capable of capturing the CO₂ emissions and transporting them through a pipeline to underground storage facilities where it can be potentially reused in other industrial processes that require CO₂. Alternately, excess CO₂ can be removed from the atmosphere by “geologic sequestration” in which underground wells are constructed for storing carbon. The geologic sequestration is subject to the Underground Injection Control (UIC) program under the Safe Drinking Water Act (SDWA) as a Class II well and as a new Class VI well for storing carbon. Sequestration also includes activities to produce energy by capturing and burning methane generated by landfills.

Furthermore, the important sequestration role of forestation projects is not sufficiently taken into account as an effective alternative approach. In general, forests are said to be “the missing piece of the carbon equation,” because they are generally not considered eligible to

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203 Id. at 98.
204 Id.
205 Id.
206 Civins, Environmental Due Diligence, supra note 145, at 39.
207 Id.
208 Id.
209 40 CFR §124, 144, 145, 146 (November 22, 2010).
210 Id.
211 Ferrey, When 1 + 1 No Longer Equals 2, supra note 60, at 664.
create carbon offsets due to the potential of loss or harvest and transformation to biomass fuel.\textsuperscript{212} 

Forests are said to remove thirty three percent of anthropogenic carbon annually.\textsuperscript{213} The legal issues regarding the “additionality” for forests are divided into prevention of deforestation (to include tropical forests in South America and Africa) and afforesting of new land.\textsuperscript{214} The main issues are potential loss of sequestration due to forest fires, pests or other causes.\textsuperscript{215} The Kyoto protocol offers offsets for planting trees but not for forest preservation, and the EU ETS excludes all forestry credits.\textsuperscript{216} As a result, forestry has become “the legal orphan of all U.S., E.U., and Kyoto carbon programs.”\textsuperscript{217} As the forests continue to be destroyed, the best natural resource for carbon sequestration is left neglected. Confined by the limitations of the cap-and-trade, policy makers continue to ignore the scientists’ assertion that “adopting forestation practices can reduce carbon concentrations to ninety percent of current levels.”\textsuperscript{218}

Other GHG reduction methods include conservation and promotion of abatement and energy-efficiency. This includes encouraging all communities to rethink their energy intensive habits and consider switching to alternative energy sources such as solar and wind. Similarly, policy makers can create plans that encourage industries and communities to reduce their carbon footprint by waste minimization efforts such as packaging modifications, using energy efficient vehicles, implementing green technologies such as paperless processes, and providing them with incentives to switch to suppliers who do the same.\textsuperscript{219}

Another neglected discussion is that policy makers should scrutinize the capital flows subsidizing fossil fuel industries across the globe. As an example, the World Bank continues to

\textsuperscript{212} Id.
\textsuperscript{213} Id.
\textsuperscript{214} Id.
\textsuperscript{215} Id. at 666.
\textsuperscript{216} Id. at 666-667.
\textsuperscript{217} Id. at 667.
\textsuperscript{218} Id. at 665.
\textsuperscript{219} Civins, \textit{Environmental Due Diligence}, \textit{supra} note 145, at 39.
fund fossil-fuel based industries in both developing and many developed countries.\textsuperscript{220} According to the Guardian, there are currently many fossil fuel projects being subsidized in developing countries by the World Bank including the funding of what would be the world’s largest coal-fired plant in South Africa.\textsuperscript{221} The 3.7 billion dollar loan for this project was approved by World Bank in 2010.\textsuperscript{222} The significance of this problem is magnified by the fact that ninety-eight percent of human-caused CO\textsubscript{2} emissions are from combustion of fossil fuels,\textsuperscript{223} and “China and India are building almost a new coal plant each week.”\textsuperscript{224}

V. Conclusion

Even though cap-and-trade offers something for everyone, its actual environmental benefits are suspect at best. There are also several challenges with its implementation on international and national levels for GHG emissions reduction. This scheme is generally untested on a large scale due to the number and variety of sources involved.\textsuperscript{225}

The nature of the problem dictates that a global approach is the only way to address the real issue. According to some commentators, even if the United States were to enact the strictest cap-and-trade system and suffer the full cost, with China and India doing nothing there would be no discernable environmental benefit achieved.\textsuperscript{226} However, one of the flaws of this system is that it makes financial gain the main driver in the battle against global warming. As an influential and respected leader in the international community, if the United States leads a

\textsuperscript{220} Id. Driesen, \textit{Linkage and Multilevel Governance}, supra note 103, at 409.
\textsuperscript{222} Id.
\textsuperscript{223} Ferrey, \textit{When 1 + 1 No Longer Equals 2}, supra note 60, at 598.
\textsuperscript{224} Id. at 599 (quoting a N.Y. Times article dated April 23, 2008).
\textsuperscript{225} Avi-Yonah, \textit{Combating Global Climate Change}, supra note 14, at 6.
\textsuperscript{226} Id. at 47.
comprehensive effort in GHG reductions, with the holistic goal of restoring the right of all earth species to survive, it is very likely that others will eventually follow suit.

Although cap-and-trade emission regulation can be one tool in the tool box to address global warming, by itself it is not enough.\textsuperscript{227} If used at all, cap-and-trade (with a declining emissions cap) should be only one component of an overall plan to achieve GHG reduction goals.\textsuperscript{228} Fundamental changes in energy production, development and conservation as well as changes in transportation, land use, and natural resource policies, must also be pursued to effectively reduce GHG emissions.\textsuperscript{229} Further study of available policy tools is needed to first prioritize and then create custom-made sector-based regulatory portfolios for each sector of the economy.

Some commentators are of the opinion that the “actual criticism lies in the implementation of the cap-and-trade rather than the core of its concept.”\textsuperscript{230} However, not only is the global cap-and-trade scheme’s moral value questionable, but also it is prone to weak market regulation potentially leading to financial instability and loss of progress in solving the environmental problems that the market was created to address in the first place.\textsuperscript{231} Supporters of the cap-and-trade presume that the shortcomings of the scheme might be mitigated by careful design and implementation,\textsuperscript{232} but the value of the most careful design is questionable without a sound ethical basis. The current mechanism is advertised as a noble environmental cause but actually creates a capital market for the right to pollute. The scheme is however not completely

\begin{footnotesize}
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\item[227] McKinstry, \textit{The New Climate World}, supra note 24, at 786-790.
\item[231] Driesen, \textit{Linkage and Multilevel Governance}, supra note 103, at 397.
\end{enumerate}
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without merit as it can act as a beginning where emitters, eager to make a profit, participate in the market. As a result, even if cap-and-trade is implemented at a national or international level as an initial step to get buy in from member states, it should be augmented with other initiatives and eventually be phased out completely, allowing sustainable environmental initiatives to take its place. Environmental initiatives such as support for innovations in clean and renewable energy and forestation help bolster the entire emission reduction effort by ensuring the global carbon market is not the only propelling force to bring about meaningful environmental benefits.\(^{233}\)

So, can the success of carbon emission cap-and-trade be predicted based upon EPA’s Acid Rain Program? The short answer is no. The entire concept behind the reported success of the ARP cap-and-trade program and its value in a broader social view are doubtful and troubling. Following the path of the ARP’s cap-and-trade program for GHGs not only does not lessen the global dependence on fossil fuels, it fosters further reliance on them by creating a thriving market for pollution. A cap-and-trade scheme would stifle innovation in clean energy by turning pollution into a valuable commodity, and most importantly, it does not lead to alleviating the underlying environmental problem. ARP’s apparent success not only does little to alleviate these concerns, it gives the policy makers as well as the general public a false sense of security that environmental issues are being addressed. Furthermore, ARP’s effective enforcement mechanism would not exist outside the context of U.S. regulatory framework and this amplifies the weaknesses of implementing the cap-and-trade scheme on a global, consensus-based level. As a result, any cap-and-trade concept can perhaps be used as a reference and a starting point, but not as the reliable model to address global GHG emission controls.\(^{234}\)

\(^{233}\) Id. at 17 (describing the need for supplementing cap-and-trade with other initiatives).

\(^{234}\) Young, Designing an Effective Cap-and-Trade, supra note 11, at 1401.
Recent Arab countries’ governmental instabilities brought back the nagging question of whether the emergency oil reserves should be tapped yet again to relieve the rise in consumer gas prices. However, as the price of gas increases at the pumps, United States politicians are once more reminded of the pressing need to wean the country off fossil fuels. They must be reminded continuously that the ultimate goal of carbon emission regulation is not to appease the industry and the financial sectors by achieving a thriving carbon market; rather, the goal is to bring balance back to life on the planet by fostering a technological, educational and social environment that effectively transforms our fossil-fuel dependence to clean energy solely because it is the “right” thing to do.