

**U.S. Legislation and Regulations to Address Climate Change:
Experiences at the Federal, Regional, and State Level to
Inform China's Climate Change Law**

Completed for:
Natural Resources Defense Council,
China Environmental Law & Governance Project

May 2015



This paper was written by members of the Harvard Law & International Development Society, supervised by attorneys from Orrick, Herrington & Sutcliffe LLP.

Sarah Weiner, Harvard Law School, J.D. '15
Ally Chiu, Harvard Law School, J.D. '17
Chu Chu, Harvard Law School, J.D. '17
Sarah Golkar-Moghaddam, Fletcher School of Law & Diplomacy, MALD '16
Zijia Guo, Fletcher School of Law & Diplomacy, MIB '15
Yanping Lu, Harvard Law School, LL.M. '15
Smita Rana, Fletcher School of Law & Diplomacy, MALD '16
Pradeep Arjan Singh, Harvard Law School, LL.M. '15
Eleanor Tang, Harvard Law School, J.D. '17

P. Quinn Moss, Partner, Orrick, Herrington & Sutcliffe LLP
Jie (Jeffrey) Sun, Partner, Orrick, Herrington & Sutcliffe LLP
Louise Gibbons, Managing Associate, Orrick, Herrington & Sutcliffe LLP

For any questions or comments, please contact Sarah Weiner
(sweiner@jd15.law.harvard.edu).

TABLE OF CONTENTS

Table of Contents	3
Glossary	5
Executive Summary	8
I. Introduction and Overview: The U.S. Legal Framework to Address Climate Change	10
A. Historical Overview of U.S. Legislation to Confront Climate Change.....	10
B. Framework of U.S. Legislation to Confront Climate Change	13
1. <i>At the Federal Level</i>	13
2. <i>At the State Level</i>	15
C. Overall Impact of Implementation of U.S. Legislation to Confront Climate Change.....	20
II. Case Studies: Regulatory Systems.....	23
A. The Clean Power Plan Rule	23
1. <i>Key Elements of the CPP</i>	23
2. <i>Overview of the System and Means of Implementation</i>	23
3. <i>Expected Issues with Implementation and Criticisms of the CPP</i>	26
4. <i>Key Takeaways</i>	29
B. Massachusetts’s Global Warming Solution Act.....	31
1. <i>Key Elements of the MGWSA</i>	31
2. <i>Overview of Selected Programs and Means of Implementation</i>	32
3. <i>Implementation Results for Selected Programs</i>	34
4. <i>Key Takeaways</i>	36
C. California’s Global Warming Solutions Act (“AB 32”)	38
1. <i>Key Elements of AB 32</i>	38
2. <i>Overview of the Systems and Means of Implementation</i>	38
3. <i>Implementation Results</i>	40
4. <i>Key Takeaways</i>	41
III. Case Studies: Market Mechanisms	44
A. California’s Cap-and-Trade Program (under AB 32).....	44
1. <i>Legal History</i>	44
2. <i>Overview of the System and Means of Implementation</i>	45
3. <i>Implementation Results</i>	47
4. <i>Key Takeaways</i>	48
1. <i>System Overview and Evolution</i>	50
2. <i>Implementation Mechanisms</i>	51
3. <i>Obstacles to Implementation and Effectiveness</i>	53
4. <i>Key Takeaways</i>	56
IV. Case Studies: Planning and Environmental Impact Assessments	58
A. MEPA GHG Policy and Protocol (under MGWSA).....	58
1. <i>Overview of System and Means of Implementation</i>	58
2. <i>Implementation Results</i>	59
B. New York’s Community Risk and Resiliency Act.....	59
1. <i>Key Elements of the Act</i>	60
C. Key Takeaways	60
V. Case Studies: Registration, Monitoring, and Evaluation.....	62
A. Mandatory Reporting of GHGs Rule	62

1. <i>Background</i>	62
2. <i>Overview of the Rule and Means of Implementation</i>	63
3. <i>Implementation Results</i>	66
B. <i>The Climate Registry</i>	67
1. <i>Programs</i>	68
2. <i>Reporting Protocols</i>	68
C. <i>Key Takeaways</i>	69
VI. Key Recommendations for China	70
A. <i>Overview of Current Situation in China</i>	70
1. <i>Domestic and International Policymaking Entities</i>	71
2. <i>Existing Measures to Confront Climate Change</i>	72
B. <i>Key Overall Recommendations for Chinese Policymakers</i>	77
Appendix A: Portfolio of Key Strategies under MGWSA	80
Appendix B: Measures Laid Out in California’s Initial Scoping Plan under AB 32	83
Appendix C: Suggested Adaptation Mitigation Measures in the MEPA Draft	
Adaptation Policy	86

GLOSSARY

Abatement costs are the costs of reducing GHG emissions in a cap-and-trade program.

Adaptation is the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities.¹

The **additionality requirement** is a provision of California’s Global Warming Solutions Act, or AB 32, which requires that the offsets used to comply with its cap-and-trade program reduce emissions beyond the emissions that would be produced in a “business-as-usual” scenario. To meet this requirement, projects covered by offsets must not have been pursued but for the ability to sell the offset on the cap-and-trade market.²

Allowances are derived from the overall cap on carbon emissions set in a cap-and-trade system. Allowances are either allocated for free or auctioned to CO₂ emitters.

Biofuels are fuels that are produced from living matter, such as plants or animals. Biofuels are commonly derived from plants like corn and sugarcane.

A **cap-and-trade program** entails setting a cap or limit to the total emissions from certain regulated sources included in the program. The total emissions permitted are translated into emission allowances (one ton of CO₂e per allowance), which are either freely allocated or auctioned to the sources covered under the program. At the end of each compliance period, all the regulated sources have to surrender allowances equivalent to their total emissions during the compliance period.

Carbon capture and sequestration involves capturing CO₂ as it is emitted from sources and storing it in geological repositories.

Feed-in tariffs require utilities to pay a set rate for electricity generated by specified renewable resources.

Fuel blenders combine petroleum products, and sometimes biofuels, to produce fuel suitable for use by vehicles.

Fuel economy refers to the amount of gasoline it takes for a vehicle to travel a certain distance. In the United States, it is typically measured in miles per gallon. Average fuel economy measures the fuel economy of a fleet of vehicles, either by a specific manufacturer or the entire fleet of vehicles in use in a country.

Mitigation is the process of taking action to reduce CO₂ emissions from human activities.

¹ INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *MANAGING THE RISKS OF EXTREME EVENTS AND DISASTERS TO ADVANCE CLIMATE CHANGE ADAPTATION* 5 (C.B. Field et al. eds., 2012).

² *California Offset Program Upheld*, MARTEN LAW, Feb. 11, 2013, <http://www.martenlaw.com/newsletter/20130211-california-offset-program-upheld>.

Net metering allows utility customers with generation capabilities, such as rooftop solar, to sell that electricity to their utility provider to offset their bill for power provided by the utility.

Point sources are the points on a factory or plant where the pollution is released into the environment.

Renewable Portfolio Standards (“RPS”) require utilities to purchase or directly generate a certain amount of energy from renewable sources.

California’s **Scoping Plan** is a document mandated by its Global Warming Solutions Act, or AB 32, that describes the programs and mechanisms the state will use to meet its GHG reduction targets.

A **split incentive** problem exists when two different parties split the costs and benefits of an action. Regarding energy efficiency, a split incentive problem exists in space that is rented because usually the owner of the property has the ability to invest in efficiency but the tenants are paying the utility bills and can therefore benefit from the lower energy costs resulting from the investment.

A **subsidy** is a direct grant from the government to an individual or entity, usually to cover a specified cost.

The **Takings Clause** of the U.S. Constitution prevents the government from taking property without paying “just compensation.”

Tax credits offer the taxpayer a reduction from the amount of tax liability he owes the government.

LIST OF ACRONYMS

AB	Assembly Bill
APS	Alternative Energy Portfolio Standard
CAA	Clean Air Act
CAFE	Corporate Average Fuel Economy
CARB	California Air Resources Board
CAT	Climate Action Team
CEPA	California Environmental Protection Agency
CHP	Combined heat and power
CMA	China Meteorological Administration
CO ₂	Carbon dioxide
CO ₂ e	CO ₂ equivalent
COATS	CO ₂ Allowance Tracking System
CPP	Clean Power Plan
CRIS	Climate Registry Information System
EPA	Environmental Protection Agency
ESA	Endangered Species Act
EV	Electric vehicles
FERC	Federal Energy Regulatory Commission
GGRF	Greenhouse Gas Reduction Fund
GHG	Greenhouse gas
GRP	General Reporting Protocol
HVAC	Heating, ventilation, and air conditioning
IECC	International Energy Construction Code
LBE	Leading By Example
LCFS	Low Carbon Fuel Standard
MEPA	Massachusetts Environmental Policy Act
MGWSA	Massachusetts Global Warming Solutions Act
MMTCO ₂ e	Million metric tons of CO ₂ equivalents
MOU	Memorandum of Understanding
MPCA	Minnesota Pollution Control Agency
MRV	Monitoring, Reporting, and Verification
NDRC	National Development and Reform Commission
NEPA	National Environmental Policy Act
NHTSA	National Highway and Traffic Safety Agency
NSPS	New Source Performance Standards
PAYD	Pay As You Drive
QA	Quality assurance
R&D	Research and development
RFS	Renewable Fuel Standard
RGGI	Regional Greenhouse Gas Initiative
RPS	Renewable Portfolio Standard
UNFCCC	United Nations Framework Convention on Climate Change
VMT	Vehicle miles traveled

EXECUTIVE SUMMARY

Climate change is occurring and its impacts are already being felt all over the world.³ China and the United States, the world's two largest economies—and greenhouse gas (“GHG”) emitters are no exception to this reality. Both countries have taken steps to display global leadership to address the challenges of climate change, including each signing an agreement in 2014, in which the United States agreed to cut its emissions by 26% to 28% by 2025 and China agreed to stabilize its emissions growth by 2030.⁴

The climate change problem is largely an energy problem.⁵ 65% of global emissions and 85% of U.S. emissions come from energy or energy-related activities.⁶ The close correlation between energy consumption and economic growth, as well as the desire of countries to utilize domestic reserves of energy resources, often complicates the ability of policymakers to address climate change. Promisingly, however, 2014 data from the International Energy Agency shows that for the first time, global emissions did not increase in a year of economic expansion.⁷ Thus energy consumption and economic growth are “decoupling,” suggesting that policies to address climate change through energy efficiency and reliance on renewable energy do not require sacrificing economic growth. This is good news for both China and the United States.⁸

Amidst this backdrop, China is in the process of drafting national legislation to address climate change. The laws and regulations drafted and implemented in the United States over the past decade, at the state, regional, and federal level, can inform this process by illustrating both successes and failures in the formulation of climate policy. While the challenges the two countries face are different,⁹ there are certainly lessons and ideas from the U.S. approach that transcend those differences and can provide value when tailored to the Chinese context.

³ INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2014 SYNTHESIS REPORT: APPROVED SUMMARY FOR POLICYMAKERS 3-6 (Nov. 1, 2014), available at http://www.ipcc.ch/pdf/assessment-report/ar5/syr/SYR_AR5_SPM.pdf

⁴ THE U.S. WHITE HOUSE, FACT SHEET: U.S.-CHINA JOINT ANNOUNCEMENT ON CLIMATE CHANGE AND CLEAN ENERGY COOPERATION (Nov. 11, 2014), available at <https://www.whitehouse.gov/the-press-office/2014/11/11/fact-sheet-us-china-joint-announcement-climate-change-and-clean-energy-c>.

⁵ Jody Freeman, Presentation to Energy and Climate Law and Policy Class (Jan. 28, 2015); see also Nathan S. Lewis, *Powering the Planet*, 32 MRS BULLETIN 808 (2007); Daniel P. Schrag, *Confronting the Climate-Energy Challenge*, ELEMENTS, Jun. 2007, at 171.

⁶ Jody Freeman, Presentation to Energy and Climate Law and Policy Class (Jan. 28, 2015).

⁷ *Global energy-related emissions of carbon dioxide stalled in 2014*, INTERNATIONAL ENERGY AGENCY, Mar. 13, 2015, available at <http://www.iea.org/newsroomandevents/news/2015/march/global-energy-related-emissions-of-carbon-dioxide-stalled-in-2014.html>.

⁸ Chris Mooney, *Why the global economy is growing, but CO2 emissions aren't*, THE WASHINGTON POST, Mar. 13, 2015, available at <http://www.washingtonpost.com/news/energy-environment/wp/2015/03/1...rst-time-in-40-years-the-world-economy-grew-but-co2-levels-didnt/>.

⁹ For example, China currently consumes twice the coal as the United States because of its large manufacturing industry, whereas the U.S. economy relies much more heavily on services, a less energy-intensive sector. Daniel P. Schrag, *supra* note 5, at 175.

To shed light on lessons learned in the United States, this paper sets forth a series of case studies drawn from the U.S. experience with climate change regulation. These case studies focus primarily on mitigation strategies, but given that even a dramatic cut in global GHG emissions would not prevent some impacts from occurring,¹⁰ it also discusses adaptation strategies being pursued through the law.

This paper begins with an overview of the U.S. approach to climate change regulation and legislation. It then sets forth a series of case studies, which are organized into the following categories: regulatory systems; market mechanisms; planning and environmental impact assessments; and registration, monitoring, and evaluation. Each case study provides any necessary background information, a discussion of the mechanisms and means of implementation, the results of such implementation (except for recent laws), and key takeaways from the experience of implementing the law or regulation.

In addition to the individual key takeaways from each case study or category of case studies, this paper offers five key overall recommendations for Chinese policymakers in developing legislation to address climate change, which were formulated after considering China's specific needs and challenges. These recommendations, which are discussed in more detail in the final section of this paper, are as follows:

- 1) A robust stakeholder engagement process can facilitate buy-in from both industry groups and civil society and lead to more effective enforcement once a law and regulations are passed.
- 2) Different regions of large countries like the United States and China often require different approaches to address climate change.
- 3) Developing synergies between climate regulations and existing regulation is important for reducing the burden on industry groups and facilitating their compliance.
- 4) The design of a cap-and-trade program is critical for its success and for ensuring that it does not negatively affect economic growth. In particular:
 - a) Ensuring that reinvestment in energy efficiency is a component of the system can facilitate economic development under cap-and-trade.
 - b) Considering when designing a cap-and-trade system is the predictability of prices for market stability.
 - c) Avoiding the implementation of policies that are conflicting rather than complementary in nature.
- 5) GHG monitoring, evaluation, and verification form the foundation of any successful climate change policy.

¹⁰ CLIMATE CHANGE 2007 – IMPACTS, ADAPTATION AND VULNERABILITY: CONTRIBUTION OF WORKING GROUP II TO THE FOURTH ASSESSMENT REPORT OF THE IPCC 747 (Martin Perry et al. eds., 2007).

I. INTRODUCTION AND OVERVIEW: THE U.S. LEGAL FRAMEWORK TO ADDRESS CLIMATE CHANGE

A. HISTORICAL OVERVIEW OF U.S. LEGISLATION TO CONFRONT CLIMATE CHANGE

Historically, the U.S. government supported the development of renewable energy and energy efficiency primarily as a means of decreasing U.S. dependence on foreign oil.¹¹ At the same time, growing environmentalism and a concern about pollution also supported these policies. Specifically, the Clean Air Act (“CAA”) was passed in 1970, marking a momentous effort to address the country’s air pollution problem. Many of the policies enacted with one or both of these goals also had, and continue to have, an impact on GHG emissions. For example, the 1975 Energy Policy and Conservation Act established Corporate Average Fuel Economy (“CAFE”) Standards, which require vehicles to meet fuel economy standards set by the National Highway and Traffic Safety Agency (“NHTSA”). As a result, the average fuel economy (i.e. savings) in the United States doubled by the late 1980s.¹² In 1978, Congress passed the Public Utility Regulatory Policies Act, which for the first time required utilities to purchase power from certain renewable sources.¹³

Because these policies were driven by a desire to wean the country off foreign oil, and not by a concern about climate change,¹⁴ the rise in domestic production of oil, coal, and natural gas combined with declining oil prices led to a retreat from these policies in the 1980s.¹⁵ The 1990s brought a steep increase in public awareness about climate change but yielded little in the way of regulatory action.¹⁶ Little progress was also made in the early 2000s, however, President George W. Bush set a non-binding GHG intensity target for the United States accompanied by a series of voluntary measures and incentives to encourage reductions in GHG emissions from the private sector.¹⁷

Frustrated by the lack of progress, environmental groups and states turned to the courts to force action.¹⁸ In 1999, they petitioned the Environmental Protection Agency (“EPA”) to regulate GHGs. This petition was denied in 2003, although the Supreme Court would later overturn this denial in the landmark case *Massachusetts v. EPA* (discussed further below).¹⁹ States and climate change activists also filed suits against major GHG emitters under the common law doctrine of nuisance, arguing that emitters “unreasonably contributed to

¹¹ CHRIS WOLD ET AL., CLIMATE CHANGE AND THE LAW 617 (2nd ed. 2013).

¹² *Id.*

¹³ *Id.* at 618.

¹⁴ *Id.*

¹⁵ *Id.*

¹⁶ *Id.* at 619.

¹⁷ *Id.* at 620. Because President Bush’s target focused on *intensity* rather than *actual emissions*, overall GHG emissions could have increased, but the country could have still reached the target.

¹⁸ *Id.* at 621.

¹⁹ *Id.*

significant interference with public rights and resources.”²⁰ Courts across the country dismissed these suits and refused to allow nuisance law to be used to fight climate change.²¹ These cases were often dismissed on the grounds that the plaintiffs lacked standing to sue.²²

In addition to filing lawsuits, certain states also took direct action to address climate change in the late 1990s and 2000s.²³ They passed emissions reductions targets (e.g. Massachusetts and California, discussed in Section II) and renewable portfolio standards, which require utilities to purchase a certain percentage of renewable resources.²⁴ Other states joined together to take regional action, the most notable example being the Regional Greenhouse Gas Initiative (“RGGI”) (discussed in Section III).²⁵

2007 marked an important year in U.S. climate change policy at the federal level. The U.S. Supreme Court signaled a change in focus in its decision in *Massachusetts v. EPA*, which initiated a process that would lead to a series of federal rulemakings to address climate change under the CAA.²⁶ As mentioned above, the plaintiffs in this case, a group of states, local governments, and non-profit organizations sued EPA, claiming that climate change presented “the most pressing environmental challenge of our time” and that EPA had “abdicated” its legal responsibility to regulate GHGs.²⁷ The Supreme Court held that GHGs do fall under the definition of air pollutant under the CAA; therefore, EPA had to make a judgment as to “whether an air pollutant ‘cause[s], or contribute[s] to air pollution which may reasonably be anticipated to endanger public health or welfare.’”²⁸ Thus EPA’s reasons for not regulating GHGs under the CAA, based on its claim that effective voluntary programs were already in place and that the CAA would represent an inefficient approach to regulating climate change, could not stand.²⁹

President Barack Obama was elected in 2008, and his administration embraced the CAA as a tool to address climate change.³⁰ In 2009, EPA made the finding known as its “endangerment finding” that GHGs endanger health and welfare. As a result of this finding, EPA now had to regulate GHGs. Its first move was to regulate GHG emissions from vehicles, which it accomplished through a joint rulemaking with NHTSA.³¹ President Obama announced the results of this rulemaking, new CAFE standards for vehicle

²⁰ *Id.*

²¹ *Id.*

²² In 2011, the U.S. Supreme Court held that federal common law could not be used to limit GHG emissions from stationary sources because the Clean Air Act preempts such action.. *American Electric Power Co., Inc. v. Connecticut*, 131 S. Ct. 2527 (2011); CHRIS WOLD ET AL., *supra* note 11, at 623. Note that this decision applies only to *federal* common law and does not say anything about *state* common law.

²³ CHRIS WOLD ET AL., *supra* note 11, at 621.

²⁴ *Id.*

²⁵ *Id.* at 622.

²⁶ *Massachusetts v. E.P.A.*, 549 U.S. 497 (2007).

²⁷ *Id.* at 505.

²⁸ *Id.* at 532 (quoting Clean Air Act, 42 U.S.C. § 7521).

²⁹ *Id.*

³⁰ *Id.* at 622.

³¹ Jody Freeman, *The Obama Administration’s National Auto Policy: Lessons from the “Car Deal,”* 35 HARV. ENVTL. L. REV. 343, 344, 346-47 (2011) [hereinafter Jody Freeman, *Car Deal*].

manufactures, on May 19, 2009.³² The goal of these new standards was to make the fleet-wide average reach 35.5 miles per gallon or 250 grams per mile of CO₂ by 2016, an average efficiency improvement of 4.3% per year.³³ In addition to bringing together the two agencies, the process involved a “deeply consultative and deliberative process with a number of key stakeholders,” including the auto industry and its key labor union, United Auto Workers.³⁴ Although business groups challenged the new standards, auto manufacturers intervened on the side of the government in the lawsuit. For the government to have been able to gain this much support from a regulated group for a regulation that further significantly regulates their industry was a remarkable achievement in U.S. politics. Engaging in this type of process with stakeholders is a common theme in U.S. climate regulations.³⁵

Around this time, the American Clean Energy and Security Act of 2009,³⁶ which would have established a national cap-and-trade system failed to pass both houses of the U.S. Congress and become law.³⁷ However, EPA’s decision to regulate CO₂ from vehicles set off a “legal domino effect.”³⁸ CO₂ was now a “regulated pollutant” under the CAA, which meant that EPA was required by law to regulate it from other sources of production as well.³⁹ Thus, EPA began a process of promulgating rules to bring CO₂ under the gambit of the other programs of the CAA. However, its attempts to regulate it under the Prevention of Significant Deterioration Program⁴⁰ were halted by a Supreme Court decision finding that “air pollutant” in the part of the statute outlining that program does not include GHGs such as CO₂.⁴¹

Nonetheless, EPA has continued to utilize the CAA as a tool to regulate GHG emissions. For example, EPA is currently setting New Source Performance Standards and Existing Source Performance Standards for the electricity sector, which is discussed in more detail in the case study on the Clean Power Plan Rule.

³² *Id.* at 363.

³³ *Id.* at 344.

³⁴ *Id.* at 363.

³⁵ *Id.* The auto industry supported the rule largely due to the fact that if the rule did not stand, it would face three different standards—one from NHTSA, one from EPA, and one from California, who was exercising its ability to set stricter standards than the federal government.

³⁶ H.R. 2454, 111th Cong. (as passed House, Jun. 26, 2009).

³⁷ Jody Freeman, *Car Deal*, *supra* note 31, at 366.

³⁸ *Id.* at 367.

³⁹ *Id.* at 352.

⁴⁰ The Prevention of Significant Deterioration (“PSD”) Program under the CAA seeks to protect areas of the country that are already in compliance with one of the National Ambient Air Quality Standards (“NAAQS”). To this end, it applies a technology-based performance standard to new sources of air pollution being constructed in the area. Although there are only six air pollutants that are covered by NAAQS, the PSD Program regulates a broader scope of air pollutants coming from the new source. Clean Air Act, 42 U.S.C. §§ 7475-7479.

⁴¹ *UARG v. EPA*, 134 S. Ct. 2427 (2014). The PSD permit requirement applies to sources that emit over certain thresholds of air pollutants. These thresholds are set with local air pollution in mind, and when applied to CO₂, millions of new sources, including some houses and small restaurants, would fall under the program. This drove the Court’s decision that “air pollutant” in this context could not be intended to include GHGs.

The Obama Administration has also taken steps to significantly support the continued development of renewable energy in the United States, primarily in the form of tax credits and federal grants (discussed further below).⁴² However, at the same time, it has supported the development of domestic oil and gas production, leaving some concerned that the United States will continue to rely on these fossil fuels for the foreseeable future.⁴³

Table 1 provides an overview major federal action related to climate change.

Table 1: Major Federal Action Relevant to Climate Change Policies

1970	Congress passed the CAA to curb air pollution. Delegated implementation to EPA.
1975	Congress passed the Energy Policy and Conservation Act establishing fuel economy standards for vehicles. Delegated implementation to NHTSA.
1978	Congress passed the Public Utility Regulatory Policies Act requiring utilities to purchase power from certain renewable sources.
1999	Environmental groups and states petition EPA to regulate GHGs as air pollutants under the CAA.
2003	EPA denies petition to regulate GHG under CAA.
2007	The Supreme Court decides <i>Massachusetts v. EPA</i> , declaring that GHGs are air pollutants under the CAA.
2009	EPA makes “endangerment finding” that GHGs endanger health and welfare.
2009	NHTSA and EPA announce fuel economy standards that for the first time seek to reduce CO ₂ emissions from vehicles.
2009	National legislation to address climate change by establishing a cap-and-trade program fails to pass Congress.
2014	EPA proposes rules to regulate CO ₂ emissions from new and existing power plants under the CAA.

B. FRAMEWORK OF U.S. LEGISLATION TO CONFRONT CLIMATE CHANGE

1. At the Federal Level

There is no U.S. federal legislation specifically addressing climate change. Thus, it is critical to keep in mind that the framework for U.S. federal regulation impacting climate change consists of a series of rulemakings under CAA, which are promulgated and carried out by EPA. These federal rules are supplemented by a patchwork of state and local laws and regulations (discussed in further detail below). In many ways, this program-by-program, sector-by-sector, state-by-state approach is inefficient, particularly compared to a national cap-and-trade scheme.

⁴² CHRIS WOLD ET AL., *supra* note 11, at 623.

⁴³ *Id.* at 624.

Environmental groups have also turned to the courts to force regulatory agencies to take action on climate change under existing federal statutes. In some cases, they have successfully used the National Environmental Policy Act (“NEPA”) to require an environmental impact assessment to address the impacts of a project on climate change.⁴⁴ However, other courts have concluded that this is not necessary—or at least that it is not necessary when the impacts of a project are small relative to total U.S. GHG emissions.⁴⁵ Furthermore, NEPA only imposes a procedural duty to prepare an environmental assessment and does not require project proponents to reach a specific environmental or climate change outcome.⁴⁶ Nonetheless, it does have the potential to influence proponents’ decisions about the design of a project.

Another piece of federal legislation that has been enlisted in the fight against climate change is the Endangered Species Act (“ESA”).⁴⁷ Environmental groups have successfully petitioned the U.S. Fish & Wildlife Service (which falls under the Department of the Interior and implements the ESA) to list species like the polar bear that are threatened or endangered due to climate change.⁴⁸ Once a species is listed, it is entitled to certain protections, particularly related to its habitat.⁴⁹ Thus, environmental groups have sought to use the ESA as a way to force mitigation activities in the name of protecting these species.⁵⁰ However, these efforts have been unsuccessful to date, as courts largely defer to agency decisions on how to implement the ESA.⁵¹ Those agencies have thus far not sought to use the ESA to fight climate change.⁵²

In spite of this gap in national policy, the federal government has played a large role in supporting the research and development of renewable resources,⁵³ as well as technologies like carbon capture and sequestration,⁵⁴ that will be key to solving the climate change problem. In particular, a number of tax incentives have been enacted to help direct private funding to projects for emission-reduction efforts.⁵⁵ For example, the Production Tax Credit offers tax credit for electricity generated by qualified energy resources and sold by the taxpayer to the grid.⁵⁶ Similarly, the Investment Tax Credit allows a credit based on the

⁴⁴ See, e.g., *Center for Biological Diversity v. National Highway and Traffic Safety Administration*, 538 F.3d 1172 (9th Cir. 2008).

⁴⁵ CHRIS WOLD ET AL., *supra* note 11, at 720-21.

⁴⁶ *Id.* at 713.

⁴⁷ *Id.* at 738-39.

⁴⁸ *Id.* at 729.

⁴⁹ *Id.* at 739-43.

⁵⁰ *Id.* at 743-51.

⁵¹ See, e.g., *In re Polar Bear Endangered Species Act Listing*, 794 F. Supp. 2d 65, 104-06 (D.D.C. 2011).

⁵² *Id.*

⁵³ CHRIS WOLD ET AL., *supra* note 11, at 850.

⁵⁴ The Department of Energy recently announced that its carbon capture and sequestration demonstration projects have successfully stored 10 million metric tons of CO₂. U.S. Department of Energy, *In Milestone, Energy Department Projects Safely And Permanently Store 10 Million Metric Tons Of Carbon Dioxide*, BREAKING ENERGY, Apr. 23, 2015, <http://breakingenergy.com/2015/04/23/in-milestone-energy-department-projects-safely-and-permanently-store-10-million-metric-tons-of-carbon-dioxide>.

⁵⁵ CHRIS WOLD ET AL., *supra* note 11, at 851. Federal tax credits and/or subsidies for renewables have been offered in some form since the 1970s.

⁵⁶ *Id.* The Production Tax Credit has particularly helped spur growth in the wind industry.

amount of money the taxpayer has invested in qualifying renewable resources.⁵⁷ These tax incentives have the advantage of reducing bureaucratic burdens as well as mitigating the higher upfront cost of building renewable energy projects by encouraging private investment. Furthermore, tax incentives also encourage private parties' efforts in enhancing efficiency, compared with an outright grant, which may encourage investment, but not necessarily efficiency in operations. One downside is that, to date, these tax credits and subsidies have always been temporary in nature and uncertainty over whether they will be renewed disrupts industry growth.⁵⁸ The fact that industry growth has occurred during the times when these credits are in place, however, shows their efficacy and justifies a need for their continuation.⁵⁹

The federal government has also sought to promote the development of the U.S. biofuels industry.⁶⁰ In addition to the desire to increase U.S. energy security and address climate change, this policy is also driven by a desire to help rural economies and the agricultural industry.⁶¹ To this end, the U.S. Congress established the Renewable Fuel Standard ("RFS") in 2005, which it updated two years later in 2007.⁶² The RFS, which is administered by EPA,⁶³ sets a minimum volume of biofuels that must be used in the country's fuel supply for transportation each year.⁶⁴ It is not a production mandate, but rather seeks to create a demand for biofuels by applying the standard to fuel blenders. However, the RFS has been fraught with difficulties and questions over whether corn ethanol, the main biofuel produced in the United States, actually produces less GHG emissions than oil when you consider the whole life cycle and change of land uses.⁶⁵ It has also had unintended consequences on food prices.⁶⁶ Efforts to promote the growth of non-corn sources has been mixed at best, and EPA must regularly grant waivers exempting blenders from the mandate when the production is simply not there.⁶⁷

2. At the State Level

Much of the most significant climate regulation in the United States comes from state legislation and policy-making, as states can act as "laboratories of innovation" to develop the most effective policies.⁶⁸ California, in particular, has long acted as a leader in driving

⁵⁷ *Id.* The Investment Tax Credit has been utilized most by the solar industry.

⁵⁸ *Id.* at 852.

⁵⁹ *Id.*

⁶⁰ Randy Schnepf & Brent D. Yacobucci, *Renewable Fuel Standard (RFS): Overview and Issues*, CONGRESSIONAL RESEARCH SERVICE, Nov. 22, 2013.

⁶¹ *Id.* at 1.

⁶² *Id.* The Energy Policy Act of 2005 established the RFS. The Energy Independence and Security Act of 2007 later revised the standard by increasing the mandating volumes, as well as requiring a certain percentage come from fuels other than corn ethanol. *Id.* at 1-2.

⁶³ *Id.* at 2.

⁶⁴ *Id.* at 1.

⁶⁵ NATIONAL RESEARCH COUNCIL OF THE NATIONAL ACADEMIES, TRANSITIONS TO ALTERNATIVE VEHICLES AND FUELS 141-42 (2013).

⁶⁶ Randy Schnepf & Brent D. Yacobucci, *supra* note 60, at 19.

⁶⁷ NATIONAL RESEARCH COUNCIL OF THE NATIONAL ACADEMIES, TRANSITIONS TO ALTERNATIVE VEHICLES AND FUELS 141 (2013).

⁶⁸ *See Rocky Mountain Farmers Union v. Corey*, No. 12-15135, 14 (9th Cir. 2013) (discussing California's role in leading the nation in environmental policy and its ability to act as a "laboratory for innovation"); *see*

U.S. environmental policy and has continued to do so with respect to climate change.⁶⁹ Every state has adopted a law or policy that has climate implications, whether directly or indirectly.⁷⁰ However, the states vary greatly in how they pursue these policies, as well as the variety of policies deployed.⁷¹ States often see these policies as yielding substantial co-benefits—either in the form of reduced air pollution or cheaper electricity prices (for energy efficiency policies).⁷² In short, states are able to experiment with different policy approaches, some of which may one day be implemented at the federal level.⁷³

Many policy approaches are adopted by multiple states. For example, one area where states have truly been leaders is in promoting energy efficiency, recognizing this as an untapped resource that can cut electricity emissions at a low cost.⁷⁴ Energy efficiency both saves consumers money, which they can then spend elsewhere, and creates jobs because “designing and installing efficiency measures [on existing facilities] is generally more labor-intensive than building and operating new power plants.”⁷⁵ States have focused on six areas in their efforts to promote energy efficiency:⁷⁶

1. **Utility programs and policies:** States change their approach to utility regulation to encourage utilities to promote energy efficiency among their customers.⁷⁷ These programs and policies obviate the need for expensive new power plants where energy efficiency can meet demand.⁷⁸
2. **Building benchmarking and disclosure:** States create a system to compare energy use for similar buildings. This system can be combining with disclosure requirements so that potential buyers and renters can have this information when making decisions.⁷⁹
3. **Financing:** States directly offer financing, which helps consumers meet the upfront investment that pays back through lower energy costs over the years.⁸⁰

also David R. Hodas, *State Initiatives*, in GLOBAL CLIMATE CHANGE AND U.S. LAW 303, 306 (Michael B. Gerrard & Jody Freeman eds., 2nd ed., 2014).

⁶⁹ CHRIS WOLD ET AL., *supra* note 11, at 617.

⁷⁰ David R. Hodas, *supra* note 68, at 303.

⁷¹ *Id.* at 303-04.

⁷² *Id.* at 307.

⁷³ *Id.* at 306.

⁷⁴ *Scaling Up Energy Efficiency*, NRDC ISSUE BRIEF 1 (March 2013). Investments in energy efficiency in the United States could reduce electricity consumption by 23% by 2020, saving consumers \$700 billion and creating up to 900,000 jobs. MCKINSEY & COMPANY, UNLOCKING ENERGY EFFICIENCY IN THE U.S. ECONOMY (July 2009), available at

http://www.mckinsey.com/client_service/electric_power_and_natural_gas/latest_thinking/unlocking_energy_efficiency_in_the_us_economy.

⁷⁵ Testimony of Steven Nadel, Executive Director, American Council for an Energy-Efficiency Economy (ACEEE), To the Senate Energy and Natural Resources Committee, Hearing on Lessons for Federal Policy from State Efficiency and Renewable Programs, 5 (Feb. 12, 2014).

⁷⁶ *Id.* at 2.

⁷⁷ *Id.* at 3-5.

⁷⁸ *Id.* at 3.

⁷⁹ *Id.* at 5-6.

⁸⁰ *Id.* at 6-7.

4. **State lead-by-examples:** States seek to retrofit government buildings to be more efficient, which reduces costs for the state and sets an example for businesses.⁸¹
5. **Combined heat and power (“CHP”) systems:** States amend laws and regulations to remove regulatory barriers for the development of CHP systems, which are able to operate at an increased level of efficiency because they produce heat and power at the same time, avoiding waste.⁸² CHP systems also have important adaptation benefits, in that they are often able to operate during large storms when the main electricity grid is out.⁸³
6. **State Building codes:** States enact codes that set standards regarding energy use.⁸⁴

Another set of state policies has focused on reforming utility regulation to make it more amenable to the goals of energy efficiency and renewable energy. In the United States, utilities are typically subject to rate regulation, which entails the state public utility commission setting the rate the utility can charge to customers.⁸⁵ The formulas used to calculate this rate essentially reward the utilities for increasing the assets it owns (i.e. power plants) and increasing its volume of sales.⁸⁶ This means utilities have a disincentive to invest in energy efficiency, which will reduce their profits. Some states have focused on changing the way they regulate utilities to remove this disincentive and actually create incentives for utilities to engage in energy efficiency.⁸⁷

In addition to promoting energy efficiency, states have also directed their efforts toward promoting the use of renewable energy. To this end, many states have enacted renewable portfolio standards (“RPS”), which require utilities to purchase or directly generate a certain amount of energy from renewable sources.⁸⁸ As of 2012, 29 states had an RPS.⁸⁹ States vary in how they define a renewable source, with some states even allowing power produced from nuclear plants to count toward meeting targets.⁹⁰ RPSs are intended to diversify states’ energy supply and decrease GHG emission. However, states vary widely in how they have chosen to design RPSs and have thus had differing levels of success in meeting their targets.

Some states have also used net metering and feed-in tariffs to promote distributed generation⁹¹—“localized, small-scale distribution of power from a wider number of power sources.”⁹² Net metering allows utility customers with generation capabilities, such as

⁸¹ *Id.* at 7-8.

⁸² *Id.* at 8.

⁸³ *Id.*

⁸⁴ *Id.* at 9.

⁸⁵ Dan York & Martin Kushler, *The Old Model Isn’t Working: Creating the Energy Utility for the 21st Century*, AN ACEEE WHITE PAPER, 2 (Sept. 2011).

⁸⁶ *Id.* at 3.

⁸⁷ *See generally id.* for specific activities to used to achieve these policy goals.

⁸⁸ CHRIS WOLD ET AL., *supra* note 11, at 857.

⁸⁹ *Id.*

⁹⁰ *Id.* at 858.

⁹¹ *Id.* at 862.

⁹² *Id.* at 866.

rooftop solar, to sell that electricity to the utility to offset their bill.⁹³ Feed-in tariffs require utilities to pay a set rate for electricity generated by specified renewable resources.⁹⁴

While the above policies represent common initiatives adopted by various states, each state has taken its own approach to the climate change problem. *Table 2*, below, provides an overview of the specific types of laws that states have passed to reduce their share of global GHG emissions.

Table 2: Selected State Laws to Address Climate Change⁹⁵

State	Law	Description
California	Global Warming Solutions Act (2006)	Creates a cap-and-trade program, requires emissions reporting, calls for the institution a low carbon fuel standard, in addition to a number of other programs detailed in a Scoping Plan. ⁹⁶
Massachusetts	Global Warming Solutions Act (2008)	A comprehensive regulatory program to address climate change; addresses both mitigation and adaptation. Requires incorporation of these into environmental impact assessments filed under the Massachusetts Environmental Policy Act. ⁹⁷
New York	Community Risk and Resiliency Act (2014)	First (and currently only) legislation in the United States to require climate impacts be a part of the planning, permitting and funding process in all counties. One of the most comprehensive pieces of legislation on adaptation. ⁹⁸
Kentucky	Kentucky Energy Security National Leadership Act (2006)	Provides tax credits for clean coal facilities that reduce “emissions of pollutants released during generation of electricity through the use of clean coal equipment and technologies.” <i>Similar measures designed to promote clean coal also exist in states such as Kansas, Pennsylvania, Texas, and New Mexico.</i>

⁹³ *Id.* at 862.

⁹⁴ *Id.*

⁹⁵ Data for Table 1 comes from *State Legislation from Around the Country*, CENTER FOR CLIMATE AND ENERGY SOLUTIONS, <http://www.c2es.org/us-states-regions/key-legislation>; *State and Local Climate Change Laws Resource Center*, COLUMBIA LAW SCHOOL, SABIN CENTER FOR CLIMATE CHANGE LAW, <http://web.law.columbia.edu/climate-change/resources/state-and-local-climate-change-laws-resource-center>.

⁹⁶ See Section II.C., *infra*, for a case study on California’s Global Warming Solutions Act.

⁹⁷ See Section II.B., *infra*, for a case study on Massachusetts’s Global Warming Solutions Act.

⁹⁸ See Section IV.B., *infra*, for a case study on New York’s Community Risk and Resilience Act.

Oregon	House Bill 3543: Global Warming Actions (2007)	Establishes GHG reduction goals and a Global Warming Commission, responsible for making recommendations to meet the GHG reduction targets, as well as examining cap and trade systems, developing an educational strategy on global warming issues, and tracking global warming impacts on the state. Also addresses adaptation.
Hawaii	Act 234 (2007)	Requires the state to reduce emissions to 1990 levels by 2020. Rules provide a road map for reducing emissions at facilities and specify that power plants and refineries must reduce GHG emissions by 16% or face specific penalties.
Minnesota	Next Generation Energy Act (2007)	Mandated that imports of coal-fired power be offset with other carbon emissions reductions. Struck down as violation of dormant Commerce Clause ⁹⁹ but currently under appeal.
Florida	Creation of “Adaptation Action Areas” - HB 7207 Community Planning Act (2011)	Amends state’s growth management laws, including the addition of optional adaptation planning for coastal hazards and the potential impacts of sea level rise.

In addition to their own individual policies, some states have joined together in regional initiatives, to share expertise and implement policies like cap-and-trade that are more effective at larger scales. *Table 3*, below, outlines several notable state efforts to confront climate change.

⁹⁹ The dormant Commerce Clause of the U.S. Constitution prevents states from interfering with free trade between states and from regulating extraterritorially, or outside its borders. It is derived from the fact that the U.S. Constitution grants Congress the power to regulate interstate commerce.

Table 3: Selected Regional Programs to Address Climate Change¹⁰⁰

Program	Description
Regional Greenhouse Gas Initiative (2008)	Cap-and-trade program for the U.S. Northeast.
Western Climate Initiative (2007)	A collaboration of jurisdictions working together to identify, evaluate, and implement emission-trading programs. Current WCI members are British Columbia, California and Quebec. As of Jan. 2014, California and Quebec have linked their cap-and-trade programs through WCI, which now plays a role in administering them.
Pacific Coast Collaborative	Alaska, British Columbia, Washington, Oregon and California since 2008 have signed various non-binding agreements to “leverage clean energy innovation and low-carbon development to reduce effects of climate change on the regional economy.” ¹⁰¹ Focuses on facilitating cooperation and information sharing between the states/provinces.
Midwestern Regional Greenhouse Gas Reduction Accord	Illinois, Iowa, Kansas, Michigan, Minnesota, Wisconsin in 2007 signed initiative to establish reduction targets between 60 and 70 percent below 2007 levels but after first cap and trade model was released in 2010, went defunct. Could be good for lessons learned, but seems that its end was most due to political changes in leadership in member states.
Transportation and Climate Change Initiative	Collaboration among 12 NE states to reduce carbon emissions in transportation sector and dependence on oil, and promote clean energy vehicle systems. In 2011, created the Northeast Electric Vehicle Network, meaning the 11 participating jurisdictions will promote all clean vehicles and fuels and facilitate planning for and the deployment of electric vehicle charging stations and related infrastructure.

C. OVERALL IMPACT OF IMPLEMENTATION OF U.S. LEGISLATION TO CONFRONT CLIMATE CHANGE

Each law or program designed to address climate change has faced its own set of challenges. Many federal policies are too recent to fully assess and it is often difficult to tell whether a policy has led to reductions in emissions, or whether reductions are a result of other external

¹⁰⁰ Data for Table 2 comes from *Multi-State Climate Initiatives*, CENTER FOR CLIMATE AND ENERGY SOLUTIONS, <http://www.c2es.org/us-states-regions/regional-climate-initiatives>.

¹⁰¹ *Id.*

factors. For example, an economic downturn or changes in the fuel supply, such as the recent rise in the use of natural gas in the United States, which emits almost half the CO₂ of coal, can lead to significant reductions without any policy intervention. Moreover, climate change continues to be a politically sensitive issue in the United States. Nearly all regulations passed by EPA related to climate change have been hotly contested in courts as beyond EPA's authority; thus, many federal policies are only starting to be implemented.

Some policies do show clear results. For example, rises in wind production track periods when the federal tax credit for wind has been in effect.¹⁰² Federal CAFE standards have had a huge impact on raising average fuel economy in the United States as well as improving air quality. Other policies have been less successful.¹⁰³ The RFS stands out as one such policy, given its failure to spur large-scale production of biofuels other than corn ethanol.¹⁰⁴

The patchwork of state laws that exists in the United States makes it difficult to generalize as to their overall impact. A close analysis of individual state policies and programs can reveal a number of successes—as well as failures. The case studies presented in this paper seek to do precisely that.

As illustrated in *Figure 1*, U.S. GHG emissions began to decline in 2008. This trend, however, can be attributed more to the economic recession than any single policy. As the economy continues to recover from the 2008 recession, only time will tell whether the United States will be effective in continuing to reduce emissions in spite of economic growth. A recent increase in emissions in 2013 casts some doubt on the country's ability to continue to decrease GHG emissions. However, if the policies discussed in this paper, notably the Clean Power Plan (see Section II.A below), are successful, then further decreases in GHG emissions are certainly possible.

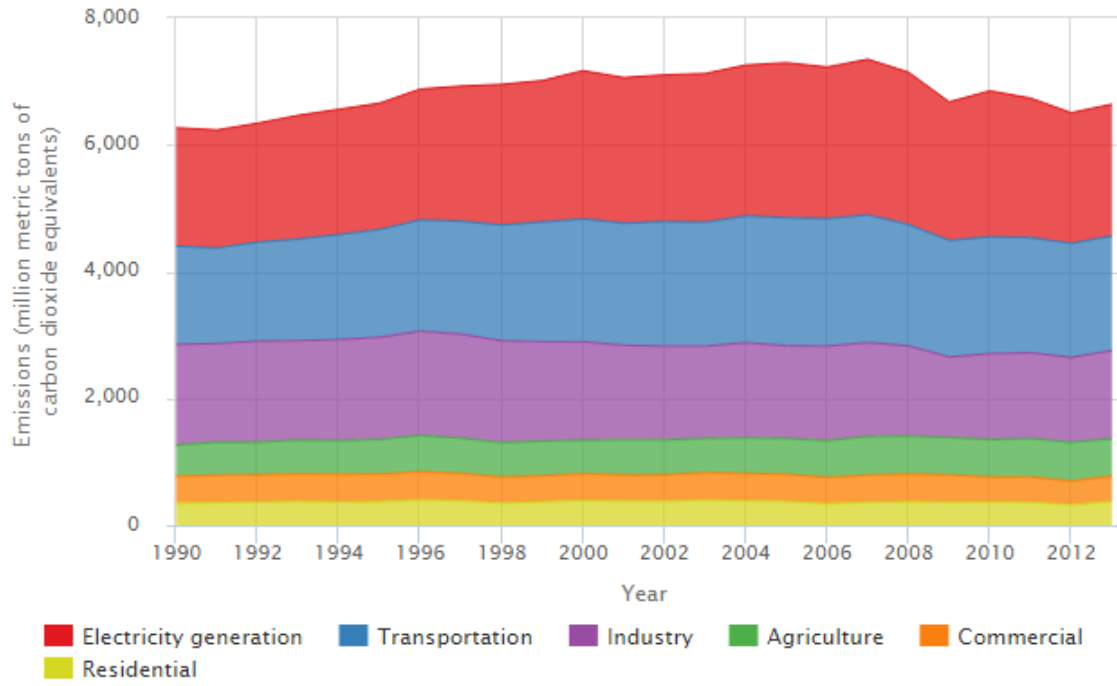
Figure 1: U.S. GHG Emissions, by Economic Sector, 1990-2013¹⁰⁵

¹⁰² CHRIS WOLD ET AL., *supra* note 11, at 851.

¹⁰³ *Id.* at 617.

¹⁰⁴ See Randy Schnepf & Brent D. Yacobucci, *supra* note 60.

¹⁰⁵ U.S. Greenhouse Gas Inventory Report: 1990-2013, U.S. ENVIRONMENTAL PROTECTION AGENCY, <http://www.epa.gov/climatechange/ghgemissions/usinventoryreport.html>.



II. CASE STUDIES: REGULATORY SYSTEMS

A. THE CLEAN POWER PLAN RULE

On June 2, 2014, EPA proposed a rule known as the Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, or otherwise simply known as the Clean Power Plan (“CPP”) Rule. If the CPP becomes final, states will be required to submit plans to address GHG emissions from existing fossil fuel fired electric generating units. The CPP is expected to be finalized in early June 2015.

1. Key Elements of the CPP

EPA derives the authority to enact the CPP from the CAA. The CAA includes a number of different programs to control and prevent air pollution, including setting standards for the emissions of air pollutants from “stationary sources” (i.e. any building, structure, facility, or installation which may emit air pollutants).¹⁰⁶ CAA Section 111(b) authorizes EPA to set New Source Performance Standards (“NSPS”) for new sources of emissions in a list of categories (distinguishing between classes, types, and sizes) that contribute significantly to “air pollution which may reasonably be anticipated to endanger public health or welfare.”¹⁰⁷ Simultaneously with setting NSPS for new sources under Section 111(b), CAA Section 111(d) requires EPA to set regulations requiring states to set Existing Source Performance Standards (“ESPS”).¹⁰⁸ Given this structure, since EPA is currently setting NSPS for power plants, EPA has also created the CPP to require states to set ESPS for existing power plants.¹⁰⁹

2. Overview of the System and Means of Implementation

The CPP operates primarily through standards that EPA has set for each of the states, which take the form of a percentage emissions reduction target for the applicable state (see *Figure 2*). In determining these standards, EPA was required by the CAA to adopt the “best system of emission reduction” that has been “adequately demonstrated” as achievable after taking into account cost, non-air quality health and environmental impacts, and energy requirements.¹¹⁰ However, EPA will leave it to each state to determine how it is going to reach the standards set for them.

Figure 2: State Carbon Reduction Targets, compared to 2012 carbon emissions, in pounds of carbon dioxide per megawatt-hour¹¹¹

¹⁰⁶ 42 U.S.C. § 7411(a).

¹⁰⁷ 42 U.S.C. § 7411(b).

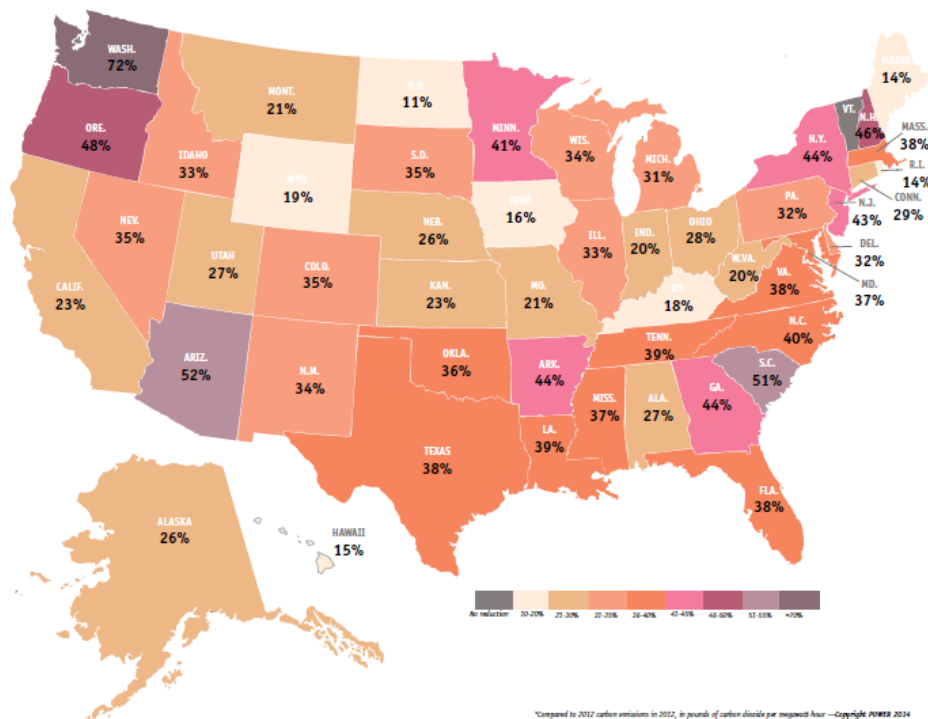
¹⁰⁸ 79 Fed. Reg. 34853.

¹⁰⁹ 79 Fed. Reg. 34854.

¹¹⁰ 79 Fed. Reg. 34855.

¹¹¹ Sonal Patel, *The EPA’s Clean Power Rule in Three Infographics*, POWER MAGAZINE, Jul. 1, 2014, available at <http://www.powermag.com/the-epas-clean-power-rule-in-three-infographics>.

EPA-SET CARBON REDUCTION TARGETS* FOR U.S. STATES
UNDER "CLEAN POWER PLAN"



EPA has provided four building blocks as guidelines for states to meet its standards:

- (1) increasing the efficiency of existing coal-fired power plants;
- (2) increasing the use of natural gas;
- (3) increasing the use of non-fossil fuel and renewable sources; and
- (4) increase end-use energy efficiency.¹¹²

With the CPP, EPA strove to include a multifaceted approach that will both increase the efficiency of power plants and “encourage substitution of less carbon-intensive ways of providing electricity services.”¹¹³ EPA has set interim goals that states must meet starting in 2020, and full compliance with the emission performance level in the state plan must be achieved by no later than 2030.¹¹⁴

States, given their differing needs and interests, are considering many different plans. Some considerations regarding which plan to use include: (1) what measures to implement to reach the emission performance standards (e.g. setting limitations on emissions, using cleaner energy sources, cutting demand and waste by consumers); (2) who will be

¹¹² *Id.*

¹¹³ 79 Fed. Reg. 34856.

¹¹⁴ 79 Fed. Reg. 34838.

responsible for the measures (e.g. only the affected power plant, or also other related entities); (3) the extent to which the measures will be federally enforced.¹¹⁵

EPA is considering permitting states to either submit plans that would hold only the power plants fully and solely responsible for meeting the emission performance level or submit plans that rely in part on measures imposed on entities other than the power plants, such as energy users, for a more balanced approach.¹¹⁶ It has also been suggested that state measures on renewable energy and end-user programs would be complementary to one another to facilitate emission limits.¹¹⁷ These measures would not be enforceable under federal law, but would be under state law.¹¹⁸ This approach avoids having federal regulators interfere with areas that have typically only been regulated at the state level.¹¹⁹

EPA has also considered a number of other approaches, which it has asked states and other stakeholders to comment on before finalizing the CPP. Two such approaches include:

a) The Portfolio Approach: EPA requires that all measures relied on to achieve the emission performance level be included in the state plan, and that inclusion in the state plan renders those measures federally enforceable.¹²⁰ The “portfolio approach” would include a state plan with emission limits for power plants along with other enforceable measures, such as renewable energy sources and end-user programs.¹²¹ Under this approach, all of the measures combined would be designed to achieve the required emission performance level.¹²² Other measures, besides the requirements imposed on power plants, would also be federally enforceable because they would be included in the state plan.¹²³ This approach may deter states from including certain measures in their state plans if they know they will be legally bound by them.¹²⁴

b) The State Commitment Approach: Under the state commitment approach, state requirements would not be considered components of the state plan and therefore would not be federally enforceable except with respect to power plants.¹²⁵ Instead, the state plan would include an enforceable commitment by the state to implement state enforceable (but not federally enforceable) measures that would achieve a specified portion of the required emission performance level on behalf of power plants.¹²⁶ However, under this approach, if the state programs rely on compliance by third parties, and if those state programs fail to

¹¹⁵ 79 Fed. Reg. 34901.

¹¹⁶ *Id.*

¹¹⁷ 79 Fed. Reg. 34902.

¹¹⁸ *Id.*

¹¹⁹ *Id.*

¹²⁰ 79 Fed. Reg. 34901.

¹²¹ *Id.*

¹²² *Id.*

¹²³ *Id.*

¹²⁴ *Id.*

¹²⁵ 79 Fed. Reg. 34902.

¹²⁶ *Id.*

achieve the expected emission reductions, the state could be held liable for violating CAA requirements and be subject to penalties.¹²⁷

3. Expected Issues with Implementation and Criticisms of the CPP

Although the CPP has not been finalized, its importance has led scholars to speculate as to the issues that will arise when it is implemented. The key issues that have been raised to date are as follows:

a) **The Proper Agency to Regulate:** Traditionally, EPA has regulated pollutants that are discharged from point sources—essentially the point on a factory or plant where the pollution is released into the environment.¹²⁸ Some argue that the CPP goes beyond what EPA has been doing for decades and is essentially an attempt by EPA to create energy policy, which is outside the scope of its authority.¹²⁹ In other words, EPA is regulating outside the fence-line of the power plant and attempting to reach out to the power grid.¹³⁰ Under the Energy Policy Act 2005, the Federal Energy Regulatory Commission (“FERC”) has jurisdiction over interstate transmission of electricity, natural gas, and oil. As the CPP essentially involves regulating the electrical grid, there is an argument that FERC should be the appropriate agency to regulate, while EPA should continue to regulate pollution as it has traditionally done.

In any event, it will be important for EPA to work together with FERC on the CPP—especially at the regional level—since states are given the flexibility to submit joint implementation plans.¹³¹ With the electric grid transcending state boundaries, it is clear that unprecedented coordination will be required to ensure grid reliability. Thus the involvement of FERC and regional entities will be essential.¹³²

b) **Social and Economic Costs:** EPA released a Regulatory Impact Analysis when it published the CPP.¹³³ This is a cost-benefit analysis of the CPP, and EPA found that the expected benefits from the CPP would exceed the estimated costs of complying.¹³⁴

¹²⁷ *Id.* The civil penalties are prescribed under Sections 205(a) and 211(d)(1) of the Clean Air Act. 42 USCS §§ 7524(a), 7545(d)(1).

¹²⁸ A point source is “a stack, vent, duct, pipe or other confined air stream from which chemicals may be released to the air.” *Improving Air Quality in Your Community: Glossary*, U.S. ENVIRONMENTAL PROTECTION AGENCY, <http://www.epa.gov/airquality/community/glossary.html#P>.

¹²⁹ Marlo Lewis, *How Unlawful is EPA’s Clean Power Plan*, GLOBAL WARMING.ORG, Jun. 10, 2014, available at <http://www.globalwarming.org/2014/10/06/how-unlawful-is-epas-clean-power-plan/>.

¹³⁰ *Id.*

¹³¹ Natalie Karas, *Recommendations for Inter-Agency Regulatory Coordination: Analyzing Reliability Impacts of EPA’s Clean Power Plan*, THE ELECTRICITY JOURNAL, December 2014, at 103, 108.

¹³² *Id.*

¹³³ U.S. ENVIRONMENTAL PROTECTION AGENCY, REGULATORY IMPACT ANALYSIS FOR THE PROPOSED CARBON POLLUTION GUIDELINES FOR EXISTING POWER PLANTS AND EMISSION STANDARDS FOR MODIFIED AND RECONSTRUCTED POWER PLANTS (June 2014), available at www2.epa.gov/sites/production/files/2014-06/documents/20140602ria-clean-power-plan.pdf.

¹³⁴ Robert Stavins, *What are the Benefits and Costs of EPA’s Proposed CO₂ Regulation*, AN ECONOMIST’S VIEW OF THE ENVIRONMENT BLOG (Jun. 19, 2014), available at <http://www.robertstavinsblog.org/2014/06/19/what-are-the-benefits-and-costs-of-epas-proposed-co2-regulation/>.

Specifically, it estimates that benefits from the CPP in the year 2030 will total \$76 billion, and costs of compliance will be \$9 billion.¹³⁵ One question that arises is who is ultimately going to bear the social costs of the CPP. Power plants will likely pass down the increase in costs to the end consumer. Nevertheless, EPA estimates that while there may be a minimal increase of between 1-2% as additional costs for power plants to comply with the CPP—which would result in an increase of between 2.7-3.2% in average electricity bills in 2020—the CPP will see dividends in the future as energy efficiency is expected to cause a decline in average electricity bills by 5.3-5.4% in 2025 and 8.4-8.7% in 2030.¹³⁶

c) Flexibility of the CPP: Some have argued that it will be more expensive for some states (i.e. those relying heavily on coal) to comply with the CPP compared to other states (i.e. those with energy efficient power plants or a strong supply of renewables).¹³⁷ This discrepancy could cause unequal burdens between states in compliance.¹³⁸ However, the CPP was created with sufficient flexibility to allow states to determine for themselves how best to achieve the targets. In setting the target for each state, EPA relied on each state's CO₂ emissions from fossil-fuel power plants for 2012 and divided it with their total electricity production.¹³⁹ Using this baseline, EPA projected each state's capacity to reduce admissions and set targets for 2030.¹⁴⁰ Thus, the CPP took into account the individual capability of each state to reduce its emissions (see *Figure 2*, above). EPA leaves it to states to determine how best to achieve their targets, and more importantly, also allows for states to submit joint implementation plans and set up regional cap-and-trade schemes to meet their targets.¹⁴¹

d) Strengthening the CPP: Some commentators believe that EPA underestimated the power of renewable energy and that the CPP, therefore, does not fully consider the rate at which states are already turning to renewables as well as the falling costs of renewable energy.¹⁴² In this respect, it is suggested that EPA specify a larger role for renewables in setting state targets in the final version of the CPP to ensure greater overall reductions.¹⁴³

¹³⁵ *Id.*

¹³⁶ *How Much Will the Clean Power Plan Cost?*, UNION OF CONCERNED SCIENTISTS, Mar. 26, 2015, available at <http://www.ucsusa.org/global-warming/reduce-emissions/how-much-will-clean-power-plan-cost>.

¹³⁷ David Bellman, *EPA's Clean Power Plan: An Unequal Burden*, PUBLIC UTILITIES FORTNIGHTLY, Oct. 2014, at 24, 26.

¹³⁸ *Id.*

¹³⁹ *Q&A: EPA Regulation of Greenhouse Gas Emissions from Existing Power Plants*, CENTER FOR CLIMATE AND ENERGY SOLUTIONS, <http://www.c2es.org/federal/executive/epa/q-a-regulation-greenhouse-gases-existing-power>.

¹⁴⁰ *Id.*

¹⁴¹ THE ANALYSIS GROUP, *EPA'S CLEAN POWER PLAN: STATES' TOOLS FOR REDUCING COSTS AND INCREASING BENEFITS TO CONSUMERS 1-3* (July 2014), available at www.analysisgroup.com/uploadedFiles/Publishing/Articles/Analysis_Group_EPA_Clean_Power_Plan_Report.pdf.

¹⁴² Steve Clemmer et al., *Strengthening the EPA's Clean Power Plan by Increasing the Contribution from Renewable Energy*, THE ELECTRICITY JOURNAL, Dec. 2014, at 93, 95-96; see also Union of Concerned Scientists, *Strengthening EPA's Clean Power Plan* (2014), available at <http://www.ucsusa.org/our-work/global-warming/reduce-emissions/role-of-renewable-energy-in-epa-clean-power-plan> (including graphics depicting UCS's estimates for renewable energy potential with EPA's estimates in the CPP).

¹⁴³ *Id.* at 96-97.

Another commonly held view is that EPA should track the electricity consumption (and not the electricity generation) of states in measuring compliance with CPP goals.¹⁴⁴ By relying on electricity generation, the CPP fails to account for the import and export of electricity. However, the actual supply and delivery of electricity does not recognize state boundaries.¹⁴⁵ This in turn could create “perverse incentives” that could ultimately undermine carbon reductions.¹⁴⁶ For example, Idaho could shut down its natural gas fired plants to meet its CPP targets.¹⁴⁷ To compensate for the lost energy, it could then start increasing the amount of electricity it imports from neighboring Wyoming, which is dominated by coal-fired plants.¹⁴⁸ This would result in an overall increase in emissions.¹⁴⁹ Similar actions by others states means they could potentially achieve their CPP goals without achieving any overall reduction in emissions.¹⁵⁰

Finally, some commentators argue that EPA should further incentivize regional implementation plans.¹⁵¹ Although EPA already encourages this, it should do more to induce states to work together as regional plans would likely be more advantageous than individual plans.¹⁵² Significantly, a regional plan would ultimately reduce the cost of compliance because it allows for allocation of the diversity of renewable resources from multiple states, increases the ability to improve grid transmission and the bulk power system, and reduces carbon leakages between states.¹⁵³

e) Challenges to the Legality of the CPP: The authorizing provision of the CPP, CAA Section 111(d), creates some controversy, as there are arguably two existing versions of it when the House and Senate passed it in 1990.¹⁵⁴ This discrepancy may ultimately just be a clerical error, but opponents of CPP are arguing that one version of the law prevents its passage.¹⁵⁵

Laurence Tribe, a prominent U.S. constitutional law scholar, claims that the CPP violates the U.S. Constitution in two ways.¹⁵⁶ First, he argues that it violates the 5th Amendment’s Takings Clause in that it effectively destroys coal as a source of energy and requires the

¹⁴⁴ Lucy McKenzie et al., *Strengthening the Clean Power Plan: Three Key Opportunities for the EPA*, THE ELECTRICITY JOURNAL, Dec. 2014, at 80, 88.

¹⁴⁵ *Id.*

¹⁴⁶ *Id.*

¹⁴⁷ *Id.*

¹⁴⁸ *Id.*

¹⁴⁹ *Id.*

¹⁵⁰ *Id.*

¹⁵¹ *Id.* at 89.

¹⁵² *Id.*

¹⁵³ *Id.*

¹⁵⁴ William Yateman, *Respectfully Rebutting Professor Revesz on EPA’s Clean Power Plan*,

GLOBALWARMING.ORG, Mar. 24, 2015), available at

<http://www.globalwarming.org/2015/03/24/respectfully-rebutting-professor-revesz-on-epas-clean-power-plan>.

¹⁵⁵ *Id.*

¹⁵⁶ LAURENCE TRIBE, COMMENTS OF LAURENCE H. TRIBE AND PEABODY ENERGY CORPORATION (December 1, 2015), available at [www.masseygail.com/pdf/Tribe-Peabody_111\(d\)_Comments_\(filed\).pdf](http://www.masseygail.com/pdf/Tribe-Peabody_111(d)_Comments_(filed).pdf).

power plants and energy industry to bear the global burden of lessening emissions.¹⁵⁷ Second, he argues that it violates the federalism principles under the 10th Amendment in that the CPP seeks to commandeer the states on electricity generation.¹⁵⁸ Environmental law scholars, however, have contested his arguments.¹⁵⁹ They argue that there is no violation of the Takings Clause because the U.S. Constitution protects only reasonable investments and there surely cannot be a legitimate expectation to continue to profit from activities that are found to harm public health and welfare.¹⁶⁰ With respect to the 10th Amendment issue, they also argue that under the CPP, states still retain the right to achieve the goals set by EPA in ways that it sees fit—this is the cooperative federalism scheme which is in place for most existing environmental regulations.¹⁶¹

4. Key Takeaways

The CPP represents EPA’s most ambitious action to date to reduce U.S. GHG emissions and address climate change. Thus even though it is still in the proposal stage, it offers a number of key lessons for designing climate change regulations:

a) Clearly identify the actions of each agency or agencies responsible for regulating climate change and their powers to enforce such regulations. Identify enforcement powers at each level of authority (municipal, provincial, federal). For effective implementation, authorities should try to avoid the overlapping of duties for various bodies, as well as fragmentation between multiple relevant agencies. There should also be a clear hierarchy for oversight mechanisms when relying on state, provincial, or local authorities to develop their own plans. In the CPP, while monitoring of compliance is the responsibility of the state, the federal agency can step in for enforcement measures if targets are not met.

b) Identify the type of plans acceptable, and what aspects of the provincial/state plan will become binding. The CPP is intended to cater to the particular circumstances of each individual state by requiring states to propagate their own plans. However, federal enforcement will guide how provinces or states design their plans, what measures they will include, and how vigorously they will enforce them. These factors (including who will bear liability if stated goals are not met) should be considered by the federal agency when designing the rule and approving plans.

c) Seek stakeholder participation to craft the most effective guidelines and policy. The differential treatment between states and flexibility in allowing each to determine their

¹⁵⁷ *Id.* at 11-15. The Takings Clause of the U.S. Constitution states, “[P]rivate property [shall not] be taken for public use, without just compensation.”

¹⁵⁸ *Id.* at 30-35. The 10th Amendment of the U.S. Constitution provides, “The powers not delegated to the United States by the Constitution, nor prohibited by it to the states, are reserved to the states respectively, or to the people.”

¹⁵⁹ Jody Freeman and Richard Lazarus, *Is the President’s Climate Plan Unconstitutional?*, HARVARD LAW TODAY, Mar. 18, 2015), available at <http://today.law.harvard.edu/is-the-presidents-climate-plan-unconstitutional/>.

¹⁶⁰ *Id.*

¹⁶¹ *Id.*

own plans means less work for the federal government, and direct involvement by state governments invites states to come up with creative solutions for their specific needs. Since there are many divergent interests at stake, the agency responsible for creating the regulation or plan should have a similar notice and comment period prior to publishing a final rule to gauge other key stakeholders' perceptions of the agency's suggestions and identify relevant considerations.

B. MASSACHUSETTS'S GLOBAL WARMING SOLUTION ACT

In 2008, Massachusetts's Global Warming Solution Act ("MGWSA") was signed into law, establishing a comprehensive set of measures to address climate change.¹⁶² MGWSA requires an economy-wide GHG emission reduction of 25% relative to the 1990 emission level by 2020, and an 80% reduction by 2050.¹⁶³ The Clean Energy and Climate Plan for 2020 was created under MGWSA and outlined the strategies that Massachusetts would employ to achieve the reduction target by 2020.¹⁶⁴ The Climate Change Adaptation Report was issued in 2010, providing a framework for developing and implementing strategies designed to enable the state to adapt to climate change while at the same time striving to mitigate GHG emissions.¹⁶⁵

1. Key Elements of the MGWSA

Massachusetts plans to achieve its GHG emissions reduction goals through 27 strategies that fall under five categories, namely:

- Buildings;
- Electricity supply;
- Transportation;
- Non-energy emissions; and
- Cross-cutting policies.¹⁶⁶

The full portfolio of Massachusetts's strategies is laid out in Appendix A. It is predicted that under these programs, a 27% reduction could be achieved by 2020, surpassing the 25% target.¹⁶⁷ Programs under the first category (buildings) are expected to produce the largest reduction (9.8%).¹⁶⁸ Most of the reduction is expected to come from two programs—All Cost Effective Energy Efficiency and Advanced Building Codes.¹⁶⁹ Cross-cutting policies that drive reductions across different sectors have also been successfully implemented in Massachusetts.¹⁷⁰ Specifically, the Massachusetts Environmental Policy Act ("MEPA") GHG Policy and Protocol is in the process of integrating climate change adaptation with mitigation in assessing and planning future projects.¹⁷¹ The Green Communities Act and

¹⁶² See EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS, COMMONWEALTH OF MASSACHUSETTS GLOBAL WARMING SOLUTIONS ACT 5-YEAR PROGRESS REPORT 1 (2013) [hereinafter MGWSA 5-YEAR PROGRESS REPORT].

¹⁶³ *Id.* at 4.

¹⁶⁴ *Id.*

¹⁶⁵ See EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS & ADAPTATION ADVISORY COMMITTEE, MASSACHUSETTS CLIMATE CHANGE ADAPTATION REPORT (2011).

¹⁶⁶ See IAN A. BOWLES, MASSACHUSETTS CLEAN ENERGY AND CLIMATE PLAN FOR 2020 13 (2010) [hereinafter MASS. CLEAN ENERGY AND CLIMATE PLAN FOR 2020].

¹⁶⁷ *Id.* at 5.

¹⁶⁸ *Id.* at 32.

¹⁶⁹ *Id.*

¹⁷⁰ *Id.* at 80-87.

¹⁷¹ EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENT AFFAIRS, DRAFT MEPA CLIMATE ADAPTATION AND RESILIENCY POLICY 2 (2015) [hereinafter DRAFT MEPA ADAPTATION POLICY].

the Leading by Example (“LBE”) program have also already led to significant GHG reductions.¹⁷² Each one of these programs is detailed in the following sections.

2. Overview of Selected Programs and Means of Implementation

MGWSA consists of a number of programs designed to work in tandem to reduce overall GHG emissions in Massachusetts. While analyzing every program is beyond the scope of this paper, the following four programs have been selected as examples of successful programs that may have particular relevance for the Chinese context:

a) All Cost-Effective Energy Efficiency: Under MGWSA, electric and gas utilities are required to pursue all cost-effective energy efficiency.¹⁷³ Essentially, they are required to work with customers to reduce energy use whenever it is less expensive than contracting for additional generation.¹⁷⁴ The program is premised on the idea that there is a substantial amount of energy waste that could be eliminated at a lower cost than obtaining new energy supplies.¹⁷⁵ However, investment in energy efficiency is below the optimal level due to various market barriers. Specifically, energy customers may lack the capital necessary upfront to pay for efficiency investments, and a “split incentive” problem exists for rental space, where only the owner of the property has the ability to invest in efficiency but the tenants are paying the utility bills.¹⁷⁶ This program is designed to overcome these barriers and incentivize consumers of energy to undertake building energy improvements. To reduce energy consumption in existing buildings, the state’s investor-owned utilities conduct energy assessments on buildings and provide financial incentives for customers to implement a variety of efficiency measures, such as installing higher-efficiency lighting and HVAC systems, adding insulation to walls, and reducing air leakage from buildings.¹⁷⁷ Technical and financial assistance are provided to the developers of new buildings as well.¹⁷⁸

b) Advanced Building Energy Codes: One of the lowest-cost options for reducing GHG emissions is to require building energy codes to meet or exceed the latest International Energy Conservation Code (“IECC”).¹⁷⁹ MGWSA establishes a shift in the design of energy codes. It no longer follows the traditional approach that prescribes specific energy measures that must be implemented but instead uses a performance-oriented approach that allows developers flexibility to design strategies to meet the mandated percentage reduction in total building energy use.¹⁸⁰ This shift is expected to increase reduction in energy use because prescriptive codes attempt to indirectly reduce energy waste through designated measures while performance-based codes directly measure and

¹⁷² See MGWSA 5-YEAR PROGRESS REPORT, *supra* note 162, at 64-67.

¹⁷³ See MASS. CLEAN ENERGY AND CLIMATE PLAN FOR 2020, *supra* note 166, at 18.

¹⁷⁴ *Id.*

¹⁷⁵ *Id.*

¹⁷⁶ *Id.* at 19.

¹⁷⁷ *Id.*

¹⁷⁸ *Id.*

¹⁷⁹ *Id.* at 20.

¹⁸⁰ *Id.*

reduce energy waste, providing the surest way to improve energy codes.¹⁸¹ This transition is expected to be complete by 2020 and building energy codes are expected to go beyond the IECC standard in terms of efficiency.¹⁸² Early in the design and construction stage is the most cost-effective time to intervene to achieve energy use reduction.¹⁸³ By marginally increasing investment upfront, developers are able to achieve a 20-30% improvement in energy efficiency, and the final owner or operator of the building will receive significant energy cost savings.¹⁸⁴

c) **LBE Program:** This program was established to reduce environmental impacts at all Executive Branch agencies and the 29 public institutions of higher education, as well as other quasi-public authorities in Massachusetts.¹⁸⁵ The program oversees efforts to reduce energy use at the buildings of these institutions, reduce fuel use among state-owned vehicles, expand recycling programs, facilitate the construction of high performance state buildings, and generally reduce GHG emissions from state operations.¹⁸⁶ A key strategy for reducing GHG emission is to transition from heating oil to natural gas, which is significantly cleaner.¹⁸⁷ Multiple state agencies are working collaboratively under the Executive Office of Energy and Environmental Affairs and the Executive Office for Administration and Finance, but currently no single entity coordinates and manages the procurement of low-cost clean energy on behalf of the state.¹⁸⁸ To address this problem, the state government would like to form the Commonwealth Energy Solutions program “to provide an opportunity for a comprehensive, integrated strategy from procurement...to continuous monitoring and management of energy performance.”¹⁸⁹

d) **Green Communities Program:** The Green Communities Act creates the Green Communities Division within the Massachusetts Department of Energy Resources. This Division encourages municipalities to make greener energy decisions by offering grant and loan opportunities to municipalities that qualify for Green Community designation.¹⁹⁰ These grants and loans are generally used for energy efficiency projects, such as retrofitting public buildings with more efficient lighting or HVAC systems.¹⁹¹ Municipalities must meet five criteria to be qualified as a Green Community:

1. Adopt local zoning bylaw or ordinance that allows “as-of-right-siting” of renewable and alternative energy R&D facilities.
2. Adopt an expedited permitting process related to the as-of-right facilities.

¹⁸¹ *Id.*

¹⁸² *Id.* at 21.

¹⁸³ *Id.*

¹⁸⁴ *Id.*

¹⁸⁵ *Id.* at 83.

¹⁸⁶ *Id.*

¹⁸⁷ See MGWSA 5-YEAR PROGRESS REPORT, *supra* note 162, at 65.

¹⁸⁸ See MASS. CLEAN ENERGY AND CLIMATE PLAN FOR 2020, *supra* note 166, at 83.

¹⁸⁹ *Id.*

¹⁹⁰ *Id.* at 85.

¹⁹¹ A list of projects funded through the Green Communities Project Grant Funding is available at <http://www.mass.gov/eea/docs/doer/green-communities/grant-program/muni-projects-green-communities.pdf>.

3. Establish a municipal energy use baseline and design a program to reduce use by 20% within 5 years.
4. Purchase only fuel-efficient vehicles for municipal use.
5. Require all new residential construction over 3,000 square feet and all new commercial and industrial real estate construction to reduce energy costs.¹⁹²

The Green Communities Act allows funding up to \$10 million per year from the proceeds of Regional Greenhouse Gas Initiative (“RGGI”) allowances¹⁹³ and other sources to support the Green Communities Division in providing technical and financial assistance to municipalities.¹⁹⁴

3. Implementation Results for Selected Programs

Because MGWSA is comprised of several distinct programs, it is essential to assess each individual program to get a sense of the overall success of the Act. Set forth below are the implementation results of the four programs outlined in Section II.B.2. above:

a) All Cost-Effective Energy Efficiency: The All Cost-Effective Energy Efficiency program is expected to produce 7.3% of GHG reduction.¹⁹⁵ This program is expected to generate \$27.7 billion of savings from \$10.2 billion of investment.¹⁹⁶ From 2009-2012, this program generated a net savings of \$4 billion on \$1.5 billion of investment and is expected to generate over \$6 billion in net savings from 2013-2015.¹⁹⁷ These savings are mostly from avoided future costs of energy and energy system expansion, and they flow into the local economy, reducing living costs for residents and operating costs for businesses.¹⁹⁸ Electricity efficiency efforts and residential heating oil and propane efficiency programs were quite successful. From 2010-2012, energy savings from electricity efforts reached 83% of the goal.¹⁹⁹ The state is confident that the electricity efficiency saving goal for 2020 will be met due to the encouraging performance trend.²⁰⁰ Similarly, for residential heating oil and propane, the respective amounts of energy savings were also close to the projected goal.²⁰¹ However, progress on natural gas efficiency programs has been slow due to the lower natural gas prices, resulting in less energy savings from increased efficiency.²⁰² The likelihood of meeting the 2020 target is medium under current progress.²⁰³

¹⁹² MASS. CLEAN ENERGY AND CLIMATE PLAN FOR 2020, *supra* note 166, at 85.

¹⁹³ An explanation of RGGI and its ability to generate funds for state energy efficiency projects is available in Section III.B., *infra*.

¹⁹⁴ MASS. CLEAN ENERGY AND CLIMATE PLAN FOR 2020, *supra* note 166, at 85.

¹⁹⁵ *See* MGWSA 5-YEAR PROGRESS REPORT, *supra* note 162, at 33.

¹⁹⁶ *See* MASS. CLEAN ENERGY AND CLIMATE PLAN FOR 2020, *supra* note 166, at 19.

¹⁹⁷ *See* MGWSA 5-YEAR PROGRESS REPORT, *supra* note 162, at 35.

¹⁹⁸ *See* MASS. CLEAN ENERGY AND CLIMATE PLAN FOR 2020, *supra* note 166, at 19.

¹⁹⁹ *See* MGWSA 5-YEAR PROGRESS REPORT, *supra* note 162, at 34.

²⁰⁰ *Id.*

²⁰¹ *Id.*

²⁰² *Id.*

²⁰³ *Id.* at 32.

b) Advanced Building Energy Codes: A 1.6% reduction in GHG emission is expected from this program by 2020.²⁰⁴ Given the long lifespan of the building stock, the effects of this program will extend beyond 2020.²⁰⁵ Building energy code reform puts Massachusetts on the path to zero-net energy buildings.²⁰⁶ However, this reform will likely take time because there are numerous stakeholders involved in the design and construction supply chain, especially for commercial buildings.²⁰⁷ In addition, the economic recession from 2008 to 2011 led to a reduction in construction of new homes and buildings, hindering the progress of this program.²⁰⁸ Residential construction is returning to its pre-recession level; hence this program is expected to deliver GHG reductions in these new buildings.²⁰⁹ However, although adoption of the advanced building energy code is on the rise, the chances of meeting the 1.6% target by 2020 is only medium.²¹⁰

c) LBE Program: Ambitious targets were set for state government operations under this program. By 2012, GHG emissions should have been reduced by 25%, and by 40% in 2020.²¹¹ The results under this program have been impressive. Despite a significant increase in the number of state buildings and increased enrollment and hours at public institutions of higher education, there has been a large reduction in GHG emissions at state facilities from 2008-2013.²¹² At the end of 2012, GHG emissions dropped by 19%, with the greatest reduction coming from community colleges, which produced a 26% reduction.²¹³ The use of heating oil in state facilities decreased by 51% and was replaced by cleaner natural gas.²¹⁴ Several facilities are on track to eliminate all uses of heating oil, which would further reduce GHG emissions.²¹⁵ There has also been significant increase in electricity generation by renewable sources such as on-site solar PV and wind.²¹⁶ In 2012, these renewable energy sources accounted for 15.2% of total electricity consumption at state facilities.²¹⁷ Heating plants have also been replaced with CHP facilities, leading to a significant increase in efficiency.²¹⁸

However, the LBE program faces two major challenges moving forward. Tracking energy use and emissions across a large number of buildings and agencies is the first challenge.²¹⁹ The state is in the process of developing a web-based tool that loads usage and cost data directly from electric utilities to effectively collect accurate data from a wide variety of

²⁰⁴ *Id.* at 35.

²⁰⁵ *See* MASS. CLEAN ENERGY AND CLIMATE PLAN FOR 2020, *supra* note 166, at 20.

²⁰⁶ *Id.*

²⁰⁷ *Id.*

²⁰⁸ *See* MGWSA 5-YEAR PROGRESS REPORT, *supra* note 162, at 35.

²⁰⁹ *Id.*

²¹⁰ *Id.* at 32.

²¹¹ *Id.* at 64.

²¹² *Id.* at 65.

²¹³ *Id.*

²¹⁴ *Id.*

²¹⁵ *Id.*

²¹⁶ *Id.* at 66.

²¹⁷ *Id.*

²¹⁸ *Id.*

²¹⁹ *Id.* at 67.

sources.²²⁰ The second challenge is financing major energy efficiency projects.²²¹ Successful implementation depends on whether there will be sufficient state resources to provide funding for large-scale projects, especially once federal stimulus dollars are no longer present.²²² To reduce costs, the state is attempting to streamline major projects by bundling similar sites together within a single agency to reduce administrative and fiscal resource demands.²²³

d) Green Communities Program: Initiatives under this program have created significant GHG reductions and energy savings.²²⁴ The commitment to lower municipal energy use by 20% over 5 years would produce over 173,000 tons CO₂e or the equivalent of taking 31,000 cars off the road.²²⁵ Nearly \$28 million has been funded towards energy conservation measures, with 53 projects completed to date.²²⁶ Projects include the installation of solar PV on public buildings, the replacement of streetlights with LED technology, and other energy conservation measures for public buildings.²²⁷ By December 2013, 123 of Massachusetts's 351 cities and towns had been designated as Green Communities. Savings in taxpayer money is a pre-existing incentive that motivates participation in the program.²²⁸ In addition, the Green Communities Division worked directly with communities to provide ongoing information, advice, and assistance, making it possible for most interested municipalities to achieve the Green Community designation.²²⁹

The Green Communities Division is in the process of creating further regulations to clarify and expand existing policies and set future targets for the program after its initial five years.²³⁰ The Division is also considering whether penalties should be imposed on Green Communities that fail to meet the designation criteria.²³¹

4. Key Takeaways

MGWSA was one of the first state laws in the United States to take a comprehensive approach to addressing climate change. Massachusetts's experience in implementing such a far-reaching law over the last seven years has illuminated a number of important lessons:

²²⁰ *Id.*

²²¹ *Id.*

²²² *Id.*

²²³ *Id.*

²²⁴ *Id.* at 67-68.

²²⁵ *Id.* at 67.

²²⁶ *Id.*

²²⁷ A list of projects funded through the Green Communities Project Grant Funding is available at <http://www.mass.gov/eea/docs/doer/green-communities/grant-program/muni-projects-green-communities.pdf>.

²²⁸ *Id.*

²²⁹ *Id.* at 67-68.

²³⁰ *Id.* at 68.

²³¹ *Id.*

a) A climate change law can be effective in setting a framework that allows a regulatory agency to produce a detailed plan to meet the goals of the law. This approach allows for more flexibility on the part of the regulator to pursue the policies that it believes will be most effective based on its expertise. It also allows for easier changes to be made if some programs prove ineffective or unexpected events arise.

b) Massachusetts’s emphasis on energy efficiency illustrates the critical nature of this policy for meeting emissions targets. In particular, the LBE program shows that government entities can set a powerful example by “practicing what they preach” and ensuring their own buildings are energy efficient. Moreover, the state is a large owner of property and transforming that property to be greener can reap benefits for overall reductions.

c) The success of the Green Communities Program shows the power of enabling and incentivizing local actors to take action on climate change. A striking number of municipalities have participated in this entirely voluntary program. Thus, one role of higher levels of government should be to enact policies to incentivize this type of local action when feasible.

C. CALIFORNIA'S GLOBAL WARMING SOLUTIONS ACT ("AB 32")

The Global Warming Solutions Act of 2006, or Assembly Bill 32 ("AB 32"), is a California state law that addresses climate change by establishing a comprehensive program to reduce GHG emissions from all sources throughout the state.²³² AB 32 was signed into law on September 27, 2006 and went into effect on January 1, 2007. AB 32 was the first program in the United States to take a comprehensive, long-term approach to addressing climate change, and it does so in a way that aims to improve the environment and preserve natural resources while maintaining a robust economy.²³³

1. Key Elements of AB 32

AB 32 requires the California Air Resources Board ("CARB") to develop regulations and market mechanisms to reduce California's GHG emissions to 1990 levels by the year of 2020, representing a 25% reduction statewide. AB 32 also allows the state governor to suspend the emissions caps for up to a year in case of emergency or significant economic harm.²³⁴

GHG emissions are defined in AB 32 to include all of the following: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), sulfur hexafluoride (SF₆), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and Nitrogen trifluoride (NF₃),²³⁵ which are the same GHGs listed in Annex A of the Kyoto Protocol.²³⁶ CARB annually updates a statewide GHG inventory.²³⁷ This inventory includes estimates of GHGs emitted to the atmosphere by human activities in California.²³⁸

2. Overview of the Systems and Means of Implementation

AB 32 requires CARB to take the following actions:²³⁹

- Prepare and approve a Scoping Plan, a document that describes the programs and mechanisms the state will use to meet its GHG reduction targets, and update the Scoping Plan every five years.²⁴⁰

²³² See Cal. Health & Safety Code §§ 38500-38599.

²³³ See *Assembly Bill 32 Overview*, CALIFORNIA AIR RESOURCES BOARD, <http://www.arb.ca.gov/cc/ab32/ab32.htm>.

²³⁴ See Cal. Health & Safety Code §§ 38550.

²³⁵ Nitrogen trifluoride was not listed initially in AB 32 but was subsequently added to the list via legislation. *Assembly Bill 32 Overview*, CALIFORNIA AIR RESOURCES BOARD, <http://www.arb.ca.gov/cc/ab32/ab32.htm>.

²³⁶ See Kyoto Protocol to the United Nations Framework Convention on Climate Change, available on http://unfccc.int/essential_background/kyoto_protocol/items/1678.php.

²³⁷ *California Greenhouse Gas Emission Inventory Program*, AIR RESOURCES BOARD, <http://www.arb.ca.gov/cc/inventory/inventory.htm>.

²³⁸ *Assembly Bill 32 Overview*, CALIFORNIA AIR RESOURCES BOARD, <http://www.arb.ca.gov/cc/ab32/ab32.htm>.

²³⁹ See Cal. Health & Safety Code §§ 38500-38599.

²⁴⁰ See *id.* at §§ 38561.

- Maintain and continue reductions of GHG emissions beyond 2020.²⁴¹
- Identify the statewide level of GHG emissions in 1990 to serve as the emissions limit to be achieved by 2020.²⁴²
- Identify and adopt regulations for discrete early actions that could be enforceable on or before January 1, 2012.²⁴³
- Adopt a regulation that establishes a system of market-based declining annual aggregate emission limits for sources or categories of sources that emit GHGs.²⁴⁴
- Convene an Environmental Justice Advisory Committee to advise CARB in developing and updating the Scoping Plan.²⁴⁵
- Appoint an Economic and Technology Advancement Advisory Committee to provide recommendations for technologies, research, and GHG reduction measures.²⁴⁶

AB 32 establishes CARB as the lead agency to implement the law.²⁴⁷ It also directs the Climate Action Team (“CAT”), comprised of fourteen state agencies, to assist CARB with the Scoping Plan.²⁴⁸ The CAT members are state agency secretaries and the heads of agencies, boards, and departments (see *Table 4*).²⁴⁹

Table 4: Agencies Included on California’s Climate Action Team

California Environmental Protection Agency	California Energy Commission
Governor’s Office of Planning and Research	California Public Utilities Commission
California Air Resources Board	California Department of Food and Agriculture
Business, Consumer Services, and Housing Agency	Department of Forestry and Fire Protection
Government Operations Agency	Department of Fish and Wildlife
California Natural Resources Agency	Department of Transportation
California Department of Public Health	Department of Water Resources
Office of Emergency Services	Department of Resources Recycling and Recovery

²⁴¹ See *id.* at §§ 38551.

²⁴² See *id.* at §§ 38550.

²⁴³ See *id.* at §§ 38562.

²⁴⁴ *Id.*

²⁴⁵ See *id.* at §§ 38591.

²⁴⁶ *Id.*

²⁴⁷ See *id.* at §§ 38510.

²⁴⁸ The CAT is also responsible for reporting on the progress made toward meeting the statewide GHG targets that were established in the executive order and further defined under AB 32. The first CAT Report to the Governor and the Legislature was released in March 2006 and is updated and issued every two years thereafter. The working groups have developed “Near-term Implementation Plans” for over 50 mitigation and adaptation strategies. *California Climate Action Team (CAT)*, GEORGETOWN CLIMATE CENTER, <http://www.georgetownclimate.org/organizations/california-climate-action-team-cat>.

²⁴⁹ *Climate Action Team and Climate Action Initiative*, CALIFORNIA CLIMATE ACTION PORTAL, http://www.climatechange.ca.gov/climate_action_team/index.html.

AB 32 authorizes the collection of a fee from sources of GHGs.²⁵⁰ In 2010, CARB adopted a regulation to collect this fee, called the AB 32 Cost of Implementation Fee Regulation.²⁵¹ This fee is collected annually from large sources of GHGs, including oil refineries, power plants (including imported electricity), cement plants, and food processors. There are approximately 250 industrial sources of GHGs from which the state collects a fee. Funds collected are used to provide staffing, contracts, and equipment to CARB and other state agencies to implement AB 32.²⁵² In addition, investments from various sources provide incentives for companies to reduce emissions. Combining strategic financial investments with policy support can accelerate market transitions to cleaner technologies.²⁵³ One important source of funding is the Greenhouse Gas Reduction Fund (“GGRF”), which is used to fund a variety of projects that will provide long-term reductions in GHG emissions. Funding for GGRF comes from auction proceeds that are part of CARB’s cap-and-trade program, which is discussed in more detail below in Section III (Market Mechanisms).²⁵⁴ As directed by AB 32, CARB’s Investment Plan evaluates opportunities for GHG reductions and identifies priority investments in the state to help achieve emission goals and realize important co-benefits.²⁵⁵

3. Implementation Results

In October 2008, CARB issued an initial Scoping Plan outlining its intended execution of AB 32.²⁵⁶ The Scoping Plan contained the main strategies California plans to use to reduce the GHG emissions, including direct regulations, alternative compliance mechanisms, monetary and non-monetary incentives, voluntary actions, and market-based mechanisms such as a cap-and-trade system.²⁵⁷ The Scoping Plan aims for approximately 30% reductions from the business-as-usual scenario by 2020, or approximately 15% below current levels.²⁵⁸ After 2020, CARB intends to reduce emissions by 80% from 1990 levels by 2050.²⁵⁹

In May 2014, CARB approved the First Update to the Climate Change Scoping Plan (the “First Update”), which builds upon the initial Scoping Plan with new strategies and

²⁵⁰ See Cal. Health & Safety Code §§ 38597.

²⁵¹ See *AB 32 Cost of Implementation Fee Regulation*, AIR RESOURCES BOARD, <http://www.arb.ca.gov/cc/adminfee/adminfee.htm>.

²⁵² *Id.*

²⁵³ *Id.*

²⁵⁴ See Section III.A., *infra*.

²⁵⁵ STATE OF CALIFORNIA, CAP-AND-TRADE AUCTION PROCEEDS INVESTMENT PLAN: FISCAL YEARS 2013-14 THROUGH 2015-16 (May 2013), *available at* http://www.arb.ca.gov/cc/capandtrade/auctionproceeds/final_investment_plan.pdf; see also *Assembly Bill 32 Overview*, CALIFORNIA AIR RESOURCES BOARD, <http://www.arb.ca.gov/cc/ab32/ab32.htm>.

²⁵⁶ *AB 32 Scoping Plan*, AIR RESOURCES BOARD, <http://www.arb.ca.gov/cc/scopingplan/scopingplan.htm>.

²⁵⁷ *Id.*

²⁵⁸ *Id.*

²⁵⁹ See *AB 32 Scoping Plan*, AIR RESOURCES BOARD, <http://www.arb.ca.gov/cc/scopingplan/scopingplan.htm>.

recommendations.²⁶⁰ The First Update highlights California’s progress toward meeting the near-term 2020 GHG emission reduction goals, outlines the latest climate change science, and provides direction on how to achieve long-term emission reductions.²⁶¹ The First Update also illustrates the status of initial Scoping Plan measures in each of California’s major economic sectors: Transportation; Electricity and Natural Gas; Water; Green Buildings; Industry; Recycling and Waste Management; Forest; High Global Warming Potential Gases; and Agriculture.²⁶² These various measures are outlined in Appendix B.

Among these measures, the Low Carbon Fuel Standard (“LCFS”) program is one of the programs that has operated successfully since its approval by CARB. In April 2009, CARB approved the LCFS regulation which set declining carbon intensity targets between 2011 and 2020 and was designed to reduce the GHG emissions intensity of transportation fuels used in California by at least 10% by 2020.²⁶³ This program established annual performance standards that fuel producers and importers must meet beginning in 2011 and applied to all fuels used for transportation in California. As of the end of Quarter 3 in 2013, regulated parties over-complied with the LCFS, generating additional LCFS credits that can be used for future compliance when the standard becomes more stringent.²⁶⁴

According to CARB, AB 32 has been implemented effectively with a suite of complementary strategies that serve as a model going forward. California is on target for meeting its 2020 GHG emission reduction goal.²⁶⁵

4. Key Takeaways

AB 32 was the first law in the United States to take a comprehensive, economy-wide approach to reducing GHG emissions. California has been implementing the law for almost ten years, and as a result, a number of lessons can be drawn from this process:

a) **The institutional design and capabilities of the agency tasked with enforcing the law greatly influences the success of implementation.** According to AB 32, CARB has full authority to “adopt rules and regulations in an open public process to achieve the maximum technologically feasible and cost-effective GHG emission reductions from sources or categories of sources, subject to the criteria and schedules set forth in this part.”²⁶⁶ However, CARB’s authority is constrained somewhat by the limiting notions of “feasibility” and “cost-effectiveness.”²⁶⁷ These considerations addressed a number of the

²⁶⁰ More details about the First Update to the AB 32 Scoping Plan, including a link to the document, are available at *First Update to the AB Scoping Plan*, AIR RESOURCES BOARD, <http://www.arb.ca.gov/cc/scopingplan/document/updatedscopingplan2013.htm>.

²⁶¹ *Id.*

²⁶² CARB, APPENDIX B - STATUS OF INITIAL SCOPING PLAN MEASURES (2014), available at http://www.arb.ca.gov/cc/scopingplan/2013_update/appendix_b.pdf.

²⁶³ See APPENDIX B, *supra* note 262.

²⁶⁴ *Low Carbon Fuel Standards*, AIR RESOURCES BOARD, <http://www.arb.ca.gov/fuels/lcfs/lcfs.htm>.

²⁶⁵ STATE OF CALIFORNIA, FIRST UPDATE TO THE CLIMATE CHANGE SCOPING PLAN (May 2014), available at http://www.arb.ca.gov/cc/scopingplan/2013_update/first_update_climate_change_scoping_plan.pdf.

²⁶⁶ See Cal. Health & Safety Code § 38560.

²⁶⁷ *Id.*

legislature's concerns that the program: (a) be consistent with environmental justice; (b) minimize costs and maximize benefits; and (c) be effective in achieving GHG reductions.²⁶⁸

b) The authorized agency can be complemented with a coordinative body. CARB was delegated to be the lead agency to implement AB 32 while CAT, made up of fourteen state agencies, was charged with helping direct state efforts on the reduction of GHG emissions and engaging state agencies. This coordination between multiple agencies eased CARB's ability to implement AB 32. CARB is located within California's Environmental Protection Agency ("CEPA"), which is part of the state's executive branch and falls under the direct authority of the state governor.²⁶⁹ It has divisions that focus on enforcement, legal affairs, and monitoring (among others), as well as divisions that focus on specific sectors of the economy like industrial and mobile sources. However, its mission and area of expertise has always been focused on air pollution. Thus, CAT is critical for allowing other agencies to supplement that expertise of CARB with their knowledge on issues like electricity regulation and water resources that are critical for climate change issues.

c) Stakeholder involvement is key in the drafting stages. During the development of AB 32, its drafters considered the different interests of various groups, including business and environmental groups.²⁷⁰ For example, business groups pushed for the inclusion of a "safety valve" that would allow the state to reduce its emissions targets if there were adverse economic consequences.²⁷¹ Such a provision was ultimately included in the legislation.²⁷² Environmental justice groups expressed reservations about the impact of a cap-and-trade system on low-income communities and succeeded in having the law allow it as an option but not to mandate it.²⁷³ These compromises were critical for obtaining the support of the governor and key legislators needed to pass AB 32.²⁷⁴ However, in spite of their engagement with drafting, environmental justice groups still brought several lawsuits against CARB challenging its authority to implement a cap-and-trade system specifically.²⁷⁵

d) Providing the agency charged with implementing the law with consistent sources of funding is important. California's programs under AB 32 have been successful in part due to the fact that the state has ensured consistent supply of funds to cover its administrative and implementation related costs. The AB 32 Cost of Implementation Fee and the GGRF have resulted in a supply of consistent funds to implement GHG reduction actions.²⁷⁶

²⁶⁸ See Cal. Health & Safety Code §§ 38500-38599.

²⁶⁹ *Organizations within the California Air Resources Board*, AIR RESOURCES BOARD, <http://www.arb.ca.gov/html/org/org.htm>.

²⁷⁰ W. Michael Henemann, *How California Came to Pass AB 32, the Global Warming Solutions Act of 2006*, CUDARE WORKING PAPERS, available at <https://escholarship.org/uc/item/1vb0j4d6>.

²⁷¹ *Id.* at 22.

²⁷² *Id.* at 23.

²⁷³ Alice Kaswan, *Climate Change and Environmental Justice: Lessons from the California Lawsuits*, 5 SAN DIEGO J. CLIMATE & ENERGY L. 1, 5 (2013-2014).

²⁷⁴ *Id.*; W. Michael Henemann, *supra* note 270, at 22-24.

²⁷⁵ Alice Kaswan, *supra* note 273, at 9-10.

²⁷⁶ *Id.*

III. CASE STUDIES: MARKET MECHANISMS

A. CALIFORNIA'S CAP-AND-TRADE PROGRAM (UNDER AB 32)

In 2013, California launched its cap-and-trade program, which is a market-based mechanism aimed to reduce GHG emissions over the period of regulation. Following the European Union's Emissions Trading System, this program is world's second largest cap-and-trade program with respect to the amount of emissions covered.²⁷⁷

A cap-and-trade program entails setting a cap or limit to the total emissions from all sources. The total emissions permitted are translated into emission allowances (one ton of CO₂e per allowance), which are either freely allocated or auctioned to the entities covered under the program. At the end of each compliance period, all the regulated entities have to surrender allowances equivalent to their total emissions during the compliance period. This kind of market mechanism involves reductions in the total allowance over the subsequent years in order to achieve greater reduction in GHG emissions.

1. Legal History

The legal basis of this program lies in AB 32, discussed in the proceeding section. As per Section 38561(b) of AB 32, CARB was mandated to prepare and approve a Scoping Plan before January 1, 2009, which was meant to identify market-based compliance mechanisms, among other measures, to achieve maximum feasible and cost-effective reductions of GHG emissions by 2020.²⁷⁸ The program was launched to achieve targeted emission reductions along with other complementary programs, like the state's RPS and the Low Carbon Fuel Standard. The complementary measures targeted 77.5% of the expected total GHG emissions reduction under AB32 while the cap-and-trade program was aimed at the remaining 22.5%.²⁷⁹

The regulations for the program were finally adopted by CARB on October 20, 2011 and came into effect on January 1, 2012. The first auction took place on November 14, 2012, and finally the compliance obligations began on January 1, 2013.²⁸⁰ In 2012, three bills—AB 1532, SB 535, and SB 1018—were passed which established the Greenhouse Gas Reduction Fund (“GGRF”) to receive auction proceeds and price containment reserve. They also mandated CARB to release an Investment Plan highlighting how the funds would be used. In May 2013, CARB released the Investment Plan for the years 2014-2016.²⁸¹

²⁷⁷ CENTER FOR CLIMATE AND ENERGY SOLUTIONS, CALIFORNIA CAP-AND-TRADE PROGRAM SUMMARY (March 2014), available at <https://www.c2es.org/docUploads/calif-cap-trade-01-14.pdf>.

²⁷⁸ The bill can be accessed at http://www.leginfo.ca.gov/pub/05-06/bill/asm/ab_0001-0050/ab_32_bill_20060927_chaptered.pdf

²⁷⁹ Bo Shen et al., *California's Cap-and-Trade Programme and Insights for China's Pilot Schemes*, 25 *ENERGY & ENVIRONMENT* 551, 554 (2014).

²⁸⁰ *Assembly Bill 32 Overview*, CALIFORNIA AIR RESOURCES BOARD, <http://www.arb.ca.gov/cc/ab32/ab32.htm>.

²⁸¹ STATE OF CALIFORNIA, CAP-AND-TRADE AUCTION PROCEEDS INVESTMENT PLAN: FISCAL YEARS 2013-14 THROUGH 2015-16 (May 2013), available at http://www.arb.ca.gov/cc/capandtrade/auctionproceeds/final_investment_plan.pdf.

Legal Obstacles: The cap-and-trade program faced several legal hurdles in its implementation. Litigation against CARB, from both environmental and business groups, included the following:

- The Association of Irrigated Residents sued CARB, claiming that cap-and-trade was not efficient enough to achieve the target GHG reduction as compared to a carbon tax or direct emission limits. Their claim was brought under California’s Environmental Quality Act, which is the state’s system for environmental impact assessments. The California First District Court of Appeal dismissed the claim, finding that CARB had considered various alternatives and chosen to pursue cap-and-trade after consulting various experts and stakeholders. This choice fit with their directive under AB 32, according to the court, and was not arbitrary or capricious.²⁸²
- The California Chamber of Commerce has a pending case against CARB. The organization challenges the regulations related to the CARB-run allowance auction and reserve sale in the cap-and-trade program as either unauthorized by AB 32 or, alternatively, as an illegal tax.²⁸³
- Another pending case brought by Citizens Climate Lobby and Our Children’s Earth Foundation challenges the use of offsets in the cap-and-trade program. The plaintiffs, all environmental groups, claimed that the rule related to offsets failed to meet the law’s “additionality requirement.”²⁸⁴ This provision requires that the offsets reduce emissions beyond the emissions that would be produced in a “business-as-usual” scenario, i.e. that the projects covered by the offset would not have been pursued but for the ability to sell the offset.²⁸⁵ California, on the other hand, claims that offsetting is necessary to keep abatement costs low.²⁸⁶ Thus far, the Superior Court that heard the case upheld the offset program, but the matter is currently under appeal.²⁸⁷

2. Overview of the System and Means of Implementation

AB 32 has granted CARB the authority to design and implement the cap-and-trade program. Under this framework, an independent Market Advisory Committee and a Market Surveillance Committee was also established to control market manipulation.

²⁸² *California Faces More Litigation over AB 32*, MARTEN LAW (Feb. 26, 2013), <http://www.martenlaw.com/newsletter/20130226-california-ab-32-litigation>; *Association of Irrigated Residents v. California Air Resources Board*, 42 ENVTL. L. REP. 20127, available at <https://elr.info/litigation/42/20127/association-irrigated-residents-v-california-air-resources-board>.

²⁸³ *Cal. Chamber of Commerce v. Cal. Air Res. Bd.*, No. C075930 (Cal. Ct. App.); *Morning Star Packing Co. v. Cal. Air Res. Bd.*, No. C075954 (Cal. Ct. App.).

²⁸⁴ *California Offset Program Upheld*, MARTEN LAW, Feb. 11, 2013, <http://www.martenlaw.com/newsletter/20130211-california-offset-program-upheld>.

²⁸⁵ *Id.*

²⁸⁶ *Citizens Climate Lobby and Our Children’s Earth Foundation v. Cal. Air Res. Bd.*, No. A138830 (Cal. Ct. App.).

²⁸⁷ *California Offset Program Upheld*, MARTEN LAW, Feb. 11, 2013, <http://www.martenlaw.com/newsletter/20130211-california-offset-program-upheld>.

The cap-and-trade program consists of the following components:

- **The cap:** The cap reduces by about three million metric tons of emissions, about 2%, from the first to the second year. After transportation fuels, natural gas, and other fuels suppliers are covered under the regulation in 2015, the cap tightens by approximately 12 million metric tons of emissions per year, an average annual reduction of 3.3%.²⁸⁸
- **Emissions reporting and verification:** Since 2008, all major GHG sources have been mandated to report their annual emissions to CARB.²⁸⁹
- **Regulation coverage:** Major GHG emitters generating more than 25,000 metric tons of CO₂e per year are covered under the program. This includes electricity generators (including imports) and large stationary entities (e.g., refineries, oil and gas production facilities, food processing plants, cement production facilities, and glass manufacturing facilities). Starting in 2015, the scope was expanded to cover distributors of transportation fuels, natural gas, and other fuels, resulting in a total coverage of 85% of the state's total emissions.²⁹⁰
- **Compliance periods:** The first compliance period included 2013 and 2014. The second compliance period will cover 2015 through 2017, and the last compliance period will be from 2018 through 2020.²⁹¹
- **Allocation of allowances:** CARB initially provides free allowances to industrial entities. CARB uses a leakage risk classification mechanism to categorize entities based on the risk they face of relocating to other states. Based on this mechanism, the number of free allowances they receive changes as the program moves ahead. However, CARB also offers free allowances to electrical distribution utilities, in order to hedge the risk of electricity bills shooting up. The utilities are required to consign their allowances to auction and the revenue is then used by CARB in implementing activities that involve utility consumers.²⁹²
- **Auctions:** A single-round, sealed-bid, uniform-price format is used wherein the highest bidder is sold the amount of allowances first and followed by others at an auction clearing price (equal to the value of lowest winning bid). Auctions are held quarterly with two types of allowances auctioned—current year vintage and future year vintage allowances. Current year allowances can be used beginning from the year they are auctioned, while future year allowances can be banked for future use but cannot be used until their vintage year. In 2012, the floor price per allowance was set at \$10 in 2012, which increases annually by 5% plus the rate of inflation.²⁹³

²⁸⁸ ENVIRONMENTAL DEFENSE FUND, CARBON MARKET CALIFORNIA: A COMPREHENSIVE ANALYSIS OF THE GOLDEN STATE'S CAP-AND-TRADE PROGRAM (YEAR ONE: 2012–2013) 3 (2014), available at http://www.edf.org/sites/default/files/content/ca-cap-and-trade_1yr_22_web.pdf [hereinafter EDF, CARBON MARKET CALIFORNIA].

²⁸⁹ *Id.* at 4.

²⁹⁰ *Id.*

²⁹¹ *Id.* at 5.

²⁹² *Id.*

²⁹³ *Id.*

- **Strategic Reserve:** In order to control market price spikes, CARB reserves a certain percentage of allowances, which increases gradually from 1% to 7%, in three tiers with prices \$40, \$45, \$50 in 2013, rising 5% annually over inflation.²⁹⁴
- **Offsets:** The program allows the entities to cover up to 8% of their obligations through offsets. The list of CARB-approved projects consists of U.S. forest projects, urban forest projects, livestock projects and ozone depleting substances (ODS) projects.²⁹⁵
- **Compliance and enforcement:** At the end of each year, all the regulated entities are required to surrender allowances/offsets for 30% of their previous year's emissions. The allowances/offsets for the balance of emissions from the entire compliance period have to be surrendered at the end of that compliance period. In the case of non-compliance, entities must surrender four times their excess emissions.²⁹⁶

3. Implementation Results

The performance in the first compliance period (2013-2014) of the California's cap-and-trade program was successful and can offer significant lessons to other existing or upcoming similar schemes across the world, including China. The California economy showed faster growth than the national average with its GDP growing by over 2% in 2013. California added 491,000 jobs, a growth of almost 3.3%, compared to a national growth rate of 2.5% during the first year and a half of the state's cap-and-trade program.²⁹⁷

According to the CARB-released emissions data, "capped emissions" decreased by almost 4% during the first year of the program. Also, California's carbon market has reflected stable allowance prices and increased trading volumes since its inception, as evident from the activity and participation level in the quarterly auctions and secondary markets. All the covered entities have been complying with their emissions limits and surrendered the right number of allowances in the first compliance period.²⁹⁸

An issue with the program has arisen in relation to the complementary measures under AB 32. The fact that the state's RPS and the Low Carbon Fuel Standard apply to the same entities covered under the cap-and-trade program could be reducing the demand for allowances.²⁹⁹ In 2012, total emissions under California's cap-and-trade program were 7% below the effective cap in 2015, signalling that there could be an oversupply of allowances.³⁰⁰

²⁹⁴ CENTER FOR CLIMATE AND ENERGY SOLUTIONS, CALIFORNIA CAP-AND-TRADE PROGRAM SUMMARY 4 (March 2014), available at <https://www.c2es.org/docUploads/calif-cap-trade-01-14.pdf> [hereinafter CCES, SUMMARY].

²⁹⁵ EDF, CARBON MARKET CALIFORNIA, *supra* note 288, at 6.

²⁹⁶ CCES, SUMMARY, *supra* note 294, at 4.

²⁹⁷ EDF, CARBON MARKET CALIFORNIA, *supra* note 288, at 5.

²⁹⁸ *Id.* at 2

²⁹⁹ Bo Shen et al., *supra* note 279, at 562.

³⁰⁰ California emissions scheme oversupplied by more than expected, BLOOMBERG NEW ENERGY FINANCE (November 19, 2013), <http://about.bnef.com/press-releases/california-emissions-scheme-over-supplied-by-more-than-expected/>.

4. Key Takeaways

California envisioned cap-and-trade as the key mechanisms through which it would achieve the GHG reduction targets mandated by AB 32 since the law's passage in 2006. Careful planning and design finally gave way to the inauguration of the cap-and-trade program in 2013. Its first years of implementation shed light on a number of lessons relevant to policymakers:

a) A well-considered and detailed action plan must be developed to avoid an overlap of measures. The Scoping Plan introduced various complementary measures along with the cap-and-trade system, but there have been concerns that such complementary measures compete with the cap-and-trade program. The regulated entities also have to comply with measures like Low Carbon Fuel Standard and the RPS, which results in an increase in abatement costs and also suppresses the demand for allowances/offsets. This could potentially result in a scenario where there is oversupply of allowances in the market, a major reason for the failure of such schemes like the E.U. Emissions Trading System market.³⁰¹

b) A level playing field should be created for vulnerable industries to avoid leakage. California calculated the risks of relocation, and hence leakage of emissions, associated with regulated entities, and grouped them into low-, medium-, and high-risk categories. Leakage is when emissions reductions within California are offset by increases outside the state. Support for entities vulnerable to leakage was offered in the form of more free allowances to higher risk firms and fewer free allowances to lower risk firms.³⁰² Such experience may be relevant to China if China is to adopt the cap-and-trade program by stages among various provinces (especially considering that transfer/shift of industries among provinces have happened in China in recent years).

c) A strong monitoring and enforcement system must be established.³⁰³ California has set up independent market surveillance bodies, which help keep track of market activities. Their efforts help protect the cap-and-trade system from any market distortionary and manipulative activities. Furthermore, California has successfully implemented a very strong non-compliance fee—a penalty at four times the excess emissions, which has effectively deterred firms from violating their obligations.

d) Policymakers should encourage market flexibility and a phased-in approach. The main advantage of a cap-and-trade scheme is that it offers market flexibility to achieve emission reductions. Offering ways of banking allowances and buying future vintages helps in hedging the risks associated with price and supply volatility in a market mechanism. Furthermore, the phased-in approach has allowed for studying the impact of

³⁰¹ Robert N. Stavins, *What Can an Economist Possibly Have to Say about Climate Change?*, HARVARD BELFER CENTER FOR SCIENCE AND INTERNATIONAL AFFAIRS (March 2015), http://belfercenter.ksg.harvard.edu/publication/25155/what_can_an_economist_possibly_have_to_say_about_climate_change.html.

³⁰² Bo Shen et al., *supra* note 279, at 569

³⁰³ *Id.* at 571.

cap-and-trade scheme on the economy and making adjustments in the subsequent compliance period. Thus, such an approach gives flexibility to deal with any negative impacts of the cap-and-trade scheme on the economy.³⁰⁴

e) **Develop an accurate emissions history.** It is vital to have accurate and ample information of historical GHG emissions in order to effectively allocate allowances to regulated entities. California implemented mandatory reporting and verification of annual emissions in 2007 while the cap-and-trade program was launched much later, in 2013, after a large database of historical GHG emissions was created.³⁰⁵

f) **Establishment of an effective institution is indispensable for the development, implementation and monitoring of the program.** California delegated this authority to CARB and also institutionalized market-monitoring bodies like the Market Advisory Committee and the Market Surveillance Committee to avoid market manipulation by participants.³⁰⁶

g) **One of the crucial reasons for California being successful in achieving its emission reductions has been the decision to target the source of GHG emissions, rather than the end-user.** The emissions-based rather than end-use-based point of regulation has helped in effectively mitigating emissions without adding extra costs and complications.³⁰⁷

h) **There is a need to incorporate ways to promote energy efficiency in regulated entities.** In the case of California, more energy efficient firms are rewarded due to the product-based intensity benchmarking approach, according to which CARB calculates emissions allowances per unit of the product manufactured.³⁰⁸

i) **There is a need to find mechanisms to replenish the allowance reserve in order to prevent its exhaustion.** The allowance reserve was set up by CARB to tackle the risk associated with spiking allowance costs. However, if the reserves are gradually exhausted, then the risk associated with price surges will also shoot up. One of the mechanisms for replenishing the allowance reserve could be offset purchases. However, this would result in a need to expand the list of offset projects approved under the cap-and-trade scheme in order to match the increase in offset demand.³⁰⁹

³⁰⁴ *Id.* at 570.

³⁰⁵ *Id.* at 567.

³⁰⁶ *Id.* at 568

³⁰⁷ *Id.*

³⁰⁸ *Id.* at 569.

³⁰⁹ Todd Schatzki and Robert N. Stavins, *Three Lingering Design Issues Affecting Market Performance in California's GHG Cap-and-Trade Program*, REGULATORY POLICY PROGRAM WORKING PAPER RPP-2014-08 (2014), available at http://www.hks.harvard.edu/~hepg/index.php/content/download/70538/1254962/version/1/file/RPP_2014_08_Stavins.pdf.

B. REGIONAL GREENHOUSE GAS INITIATIVE

The Northeast’s Regional Greenhouse Gas Initiative (“RGGI”), devised in 2003, adopted in 2009, and revised in 2012, was the first regional, market-based effort to reduce CO₂ emissions in the United States. The program aims to stem CO₂ from fossil-fueled power plants with generators that produce at least 25-megawatt electrical power—encompassing approximately 168 facilities across nine participating states.³¹⁰ The following case study analyzes the key elements of the program: evolution, design, and market mechanisms, obstacles to implementation, effectiveness, and lessons learned.

1. System Overview and Evolution

As of 2015, participants included Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont, which have enacted legislation based on a set of model rules (see *Table 5*).³¹¹ These statutes establish mechanisms for carbon pollution allowances, offsets, compliance verification, and penalties, allowing market forces to economize emissions reductions and encourage long-term investments in clean energy.³¹² In 2005, the initial nine participating states signed a Memorandum of Understanding (“MOU”) to regulate emissions at 188 million short tons annually by 2009 until 2014 when a 2.5% annual reduction mandate would be phased in and remain effective until 2019.³¹³

The stringency of RGGI’s cap has increased over time to reflect an unexpected decline in real emissions because of external factors.³¹⁴ The initial cap was set in 2005 to account for estimates that CO₂ emissions would gradually increase over time, but several factors—economic recession, advancements in energy efficiency, and changes in the electric grid—led to a dramatic decline in real emissions, rendering the cap an ineffective mechanism to bring about meaningful reductions.³¹⁵ See *Table 4* for a timeline of key RGGI developments, including an agreement to reduce the overall cap.

³¹⁰ Jonathan L. Ramseur, *The Regional Greenhouse Gas Initiative: Lessons Learned and Issues for Policymakers*, Congressional Research Service 2 (May 21, 2013), available at <http://nationalaglawcenter.org/wp-content/uploads/assets/crs/R41836.pdf>.

³¹¹ *State Statutes & Regulations*, REGIONAL GREENHOUSE GAS INITIATIVE, <https://www.rggi.org/design/regulations>.

³¹² *Id.*

³¹³ See Memorandum of Understanding, Regional Greenhouse Gas Initiative, available at http://www.rggi.org/docs/mou_final_12_20_05.pdf.

³¹⁴ Jonathan L. Ramseur, *supra* note 310, at 4.

³¹⁵ *Id.*

Table 4: Key RGGI Developments Since Initial MOU in 2005

Year	Key Development
2007	Maryland joins RGGI. ³¹⁶
2011	New Jersey withdraws from RGGI; cap adjusted from 188 to 165 million short tons CO ₂ per year to account for withdrawal. ³¹⁷
2012	States agree to a 45% reduction in cap adjusted to 91 million short tons. Agree to further reduce emissions by 2.5% from 2015 to 2020. ³¹⁸
2014	New cap and follow-on emissions reductions take effect. ³¹⁹

2. Implementation Mechanisms

State CO₂ emissions are regulated by state-level statutes, which specify emissions levels, allowances, and allocations. Elements of this process are overseen by state environmental regulatory agencies, a “regional organization” comprised of member state representatives, and independent monitors.

a) Auctions and Banking: Emissions allocations are sold at auctions on a quarterly basis.³²⁰ If particular price thresholds are met, RGGI introduces “cost containment curves,” or additional allowances to increase the overall cap by between 5 and 10 million annually.³²¹ Any remaining allocations after auction are put into a “set-aside” account.³²² See *Figure 3* below for the distribution of CO₂ allowances between 2012-2014 (the second control period).

³¹⁶ Environmental Defense Fund and International Emissions Trading Association, *Regional Greenhouse Gas Initiative, The World’s Carbon Markets: A Case Study Guide to Emissions Trading 1* (May 2013), available at

http://www.ieta.org/assets/Reports/EmissionsTradingAroundTheWorld/edf_ieta_rggi_case_study_may_2013.pdf [hereinafter EDF & IETA, *The World’s Carbon Markets*].

³¹⁷ *Id.*

³¹⁸ Jonathan L. Ramseur, *supra* note 310, at 7.

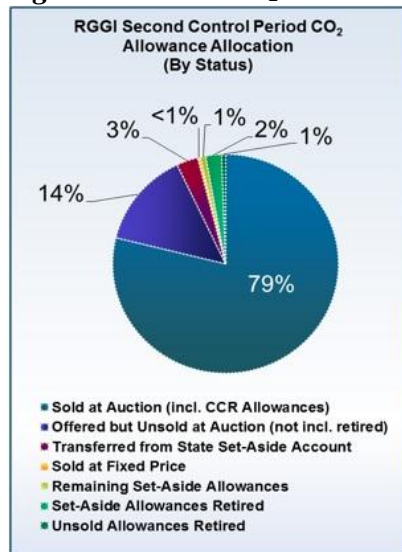
³¹⁹ *The RGGI CO₂ Cap*, REGIONAL GREENHOUSE GAS INITIATIVE, <http://www.rggi.org/design/overview/cap>.

³²⁰ *CO₂ Allowance Auctions*, REGIONAL GREENHOUSE GAS INITIATIVE, <http://www.rggi.org/market/182-co2-auctions>.

³²¹ *Id.* at 15.

³²² EDF & IETA, *The World’s Carbon Markets*, *supra* note 316, at 4.

Figure 3: RGGI CO₂ Allowance Allocation, 2012-2014³²³



Entities can “bank” an unlimited number of emissions allowances, enabling a large degree of flexibility over time that reduces the risk of penalties for noncompliance.³²⁴

b) Consumer Benefit Allocation: RGGI state participants in 2005 agreed that at least 25% of revenue from emissions allowances would be invested in new energy technologies or other similar initiatives to benefit consumers.³²⁵ However, reports indicate that states have also used the revenues, aside from the required reinvestments, for more controversial purposes, including paying down government deficits.³²⁶

c) Offsets: Emitters have the option of using “offsets” to compensate for up to 3.3% of excess CO₂ emissions by undertaking “landfill methane reductions, sulfur hexafluoride reductions from specific industrial activities, forest sequestration projects, energy efficiency projects, and avoided methane from manure management projects.”³²⁷

d) Compliance and Penalties: RGGI uses a 3-year compliance period to adjust for the price swings caused by market volatility.³²⁸ Thus, every three years, emitters submit emissions allowances commensurate with their CO₂ emissions.³²⁹ State environmental regulatory agencies use RGGI COATS (CO₂ Allowance Tracking System), a publicly available online platform, to ensure compliance with RGGI standards.³³⁰ If emitters exceed their allotments, they are obliged to forfeit CO₂ allowances equal to that of three-times

³²³ This chart was taken directly from RGGI’s website. *2012-2014 Allocation*, REGIONAL GREENHOUSE GAS INITIATIVE, <https://www.rggi.org/market/tracking/allowance-allocation/2012-2014-allocation>.

³²⁴ Jonathan L. Ramseur, *supra* note 310, at 3.

³²⁵ *Id.* at 11.

³²⁶ *Id.* at 14.

³²⁷ *Id.* at 15.

³²⁸ *Id.* at 6.

³²⁹ *Id.* at 3.

³³⁰ *RGGI COATS Platform*, REGIONAL GREENHOUSE GAS INITIATIVE, <http://www.rggi.org/market/tracking/coats-platform>.

their excess emissions.³³¹ Non-compliant entities may be subject to state-specific penalties to be determined by member states.³³²

e) **Model Rule:** RGGI’s “Model Rule” serves as the framework for states’ implementing legislation and contains the agreed upon emissions standards and program mechanisms reached through negotiation.³³³ The Model Rule has been modified several times to reflect both substantive and non-substantive changes and to maintain consistency with state legislation.³³⁴ See *Table 5* for a summary of the various subparts covered in the Model Rule.

Table 5: Summary of the RGGI Model Rule³³⁵

Subpart 1	Sets out purpose of the general provision, defines key terms, lays out applicability, requirements, and severability.
Subpart 2	Identifies parameters for CO ₂ authorized account representatives for the trading program.
Subpart 3	Discusses general requirements for permits, submission of CO ₂ budget, and permit applications.
Subpart 4	Lays out reporting and compliance certification procedures.
Subpart 5	Stipulates handling of CO ₂ allowance allocations, undistributed and unsold allowances, general allocation.
Subpart 6	Sets structure for CO ₂ allowance tracking system, including recording, compliance practices, banking, and error.
Subpart 7	Establishes parameters for CO ₂ allowance transfers: submission, recordation, and notification.
Subpart 8	Monitoring and reporting requirements, including certification.
Subpart 9	Details procedures for auction of CO ₂ cost containment reserve allowances
Subpart 10	Sets guidelines for CO ₂ emissions offsets projects including definitions, requirements, application process, standards, accreditation and verification, and aware and recordation of offset allowance.

3. Obstacles to Implementation and Effectiveness

As the first cap-and-trade system developed in the United States, RGGI has somewhat of a mixed record. Proponents and analysts claim that it has not had a negative economic impact on the Northeast and has in fact contributed to growth. While GHG emissions have been reduced during its implementation, it is unclear whether this reduction is due to RGGI. Finally, it has faced political obstacles in its implementation, given the charged nature of

³³¹ *Id.*

³³² *Regional Greenhouse Gas Initiative (RGGI)*, CENTER FOR CLIMATE AND ENERGY SOLUTIONS, <http://www.c2es.org/us-states-regions/regional-climate-initiatives/rggi>.

³³³ *Model Rule*, REGIONAL GREENHOUSE GAS INITIATIVE, https://www.rggi.org/design/history/model_rule.

³³⁴ *Id.*

³³⁵ *Id.*

climate change in the U.S. political landscape. Details of its implementation and effectiveness are discussed below:

a) Economic Impact: There are differing views on the extent to which RGGI has a direct impact on the economy. Some experts argue that RGGI has created meaningful economic growth, while others assert that RGGI is merely an electricity tax for additional state revenues—perspectives that probably are driven by political beliefs and motivations.³³⁶

i) State Revenues: State revenues from allowance auctions as of November 2014 totaled \$1.8 billion, the majority of which has been reinvested into state economies to fund energy, economic, and social programs.³³⁷ Recent auction information indicates that clearinghouse prices are on the rise, probably as a result of the new cap, which could mean both a boost to government revenues and increased burden on the power sector and ratepayers.³³⁸

ii) Job Creation: State governments have reinvested revenues from allowance auctions into clean energy initiatives that have created employment opportunities and brought about a longer-term drop in consumer energy prices.³³⁹ A study by the Analysis Group from 2011 concluded that RGGI had created over 16,000 new jobs within its first three years of implementation, noting that some positions may be temporary.³⁴⁰

iii) Costs: The same Analysis Group study showed that power plants recouped losses incurred from the carbon allowance auction process by passing costs onto ratepayers. Electricity consumers saw a resulting short-term uptick in electricity prices, but their costs decreased in the longer-term because of investments in efficiency programs.³⁴¹ On a macro-level, these changes in overall demand probably will shrink the power generators' market share over time because of an estimated \$1.6 billion decrease in revenue, providing a competitive advantage to plants with lower emissions rates.³⁴²

b) Environmental Impact and Emissions Reduction: There is broad consensus that while major reductions in emissions occurred between 2005 and 2009, this was primarily a result of improvements in energy efficiency, growing reliance on cleaner fuels like

³³⁶ Marc Legrand, *The Regional Greenhouse Gas Initiative: Winners and Losers*, COLUM. J. OF ENVTL. L. (online), (Apr. 24, 2014), available at <http://www.columbiaenvironmentallaw.org/articles/the-regional-greenhouse-gas-initiative-winners-and-losers>.

³³⁷ Jonathan L. Ramseur, *supra* note 310, at 12.

³³⁸ *Id.*

³³⁹ Paul J. Hibbard et al., *The Economic Impacts of the Regional Greenhouse Gas Initiative on Ten Northeast and Mid-Atlantic States*, THE ANALYSIS GROUP, 7-8 (Nov. 15, 2011), available at

http://www.analysisgroup.com/uploadedFiles/Publishing/Articles/Economic_Impact_RGGI_Report.pdf

³⁴⁰ *Id.*

³⁴¹ *Id.* at 7.

³⁴² *Id.* at 9.

natural gas, and the occurrence of unusually warm winters.³⁴³ One study showed that the reduction in emissions in participating states mirrored that which was occurring nationwide, suggesting RGGI had little effect, if any, on bringing about real improvements in emissions.³⁴⁴ The adjusted 2014 emissions cap may prove more effective in driving down emissions as it more closely resembles real CO₂ output, but states will probably continue to face difficulty disaggregating root causes of emission reductions and attributing them directly to RGGI.

- i) **Leakage:** Several climate and policy experts have pointed to growing concern over emissions leakage—when suppliers shift energy production to unconstrained states as a means of skirting regulations.³⁴⁵ A Congressional Research Service report found electricity imports among RGGI states have steadily risen since the program’s implementation in 2009.³⁴⁶

- ii) **Other issues:** Some experts have argued that RGGI’S offset mechanisms undermine the broader goal of emissions reductions and have criticized offset standards for being vague and easy to manipulate. Environmental and social researchers have warned that the Northeast region is particularly vulnerable to the effects of climate change because of its geography and situation along the coast.³⁴⁷ They argue that failure to make more meaningful improvements will disproportionately impact low-income families unable to adequately cope with climate changes.³⁴⁸

- c) **Politics:** In 2011, New Jersey withdrew from RGGI citing two criticisms: (1) the program passed costs incurred by the power generators onto ratepayers; and (2) it failed to bring about meaningful CO₂ reductions because emitters easily stayed within their carbon limits.³⁴⁹ The state legislature, driven by Democratic representatives, has since put forth multiple bills aimed at rejoining RGGI, but Republican Governor Chris Christie has twice vetoed these bills, claiming that it hurts New Jersey businesses and taxpayers.³⁵⁰ Advocates of RGGI respond that, in addition to reducing emissions, joining RGGI would create

³⁴³ Marc Legrand, *supra* note 336.

³⁴⁴ *Id.*

³⁴⁵ Charis A. Van den Berg et al., *Carbon Leakage in the Regional Greenhouse Gas Initiative: Lessons Learnt for the European Union Emissions Trading Scheme*, UNIVERSITY OF GRONINGEN FACULTY OF LAW RESEARCH PAPER 1 (Feb. 24, 2014), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2400666.

³⁴⁶ Jonathan L. Ramseur, *supra* note 310, at 13.

³⁴⁷ See generally Gavin Kearney, *Environmental Justice and Climate Change Policy: Lessons from the Regional Greenhouse Gas Initiative*, 44 CLEARINGHOUSE REV. 230 (2010).

³⁴⁸ *Id.*

³⁴⁹ Mireya Navarro, *Christie Pulls N.J. From Greenhouse Gas Coalition*, N.Y. TIMES, May 26, 2011, available at <http://www.nytimes.com/2011/05/27/nyregion/christie-pulls-nj-from-greenhouse-gas-coalition.html>.

³⁵⁰ Tom Johnson, *Legislature Acts to Ease Reentry into Regional Greenhouse Gas Initiative*, NJ SPOTLIGHT (Oct. 24, 2014), available at <http://www.njspotlight.com/stories/14/10/23/legislature-acts-to-ease-reentry-into-regional-greenhouse-gas-initiative/>.

millions of dollars in state revenues that could boost the economy and clean energy investments.³⁵¹

d) Opposition from Utility Providers: Policymakers and state-level negotiators have cited initial resistance from the power generation sector and utility providers most affected by RGGI standards as obstacles to implementation.³⁵² These individuals have pointed to a transparent process that ensures stakeholder involvement as key to overcoming these challenges.³⁵³

e) U.S. Constitutional Concerns: Legal experts have criticized RGGI for overstepping the U.S. Constitution, particularly the Compact Clause (Art. 1, Sec. 10, cl. 3) limiting states' ability to enter into compacts with other states without congressional consent, and the dormant Commerce Clause (Art. 1, Sec. 8, cl. 3), which essentially grants Congress exclusive power over commerce that crosses state lines.³⁵⁴

4. Key Takeaways

The impetus for the formation of RGGI was to prove the feasibility of a cap-and-trade system across state lines in the United States and to provide a space for policy experimentation that could inform a national cap-and-trade system. While that national system has not materialized in the United States, RGGI still provides a long-running example of a regional cap-and-trade system, and its successes and failures are informative for policymakers:

a) Conducting a transparent negotiation process with primary stakeholders—political, technical, and industrial—is key for successful political implementation although it can also dilute effectiveness. Close coordination between energy and environmental stakeholders was important for successful adoption of the program. Early, frequent stakeholder outreach during negotiation that allows groups to voice concerns, comment on policy, and shape legislation created a collegial, cooperative process. Additionally, RGGI monitoring and evaluation systems were able to tap into similar existing methods and databases used by EPA, streamlining the implementation process.

b) Calibrating the cap continually throughout the design, implementation, and evaluation process can produce positive environmental effects and mitigate risks to energy grid reliability or other adverse economic circumstances. RGGI officials took

³⁵¹ Star-Ledger Editorial Board, *Gov. Christie fiddles, while RGGI money burns: Editorial*, NJ.COM (Sept. 11, 2014), available at http://www.nj.com/opinion/index.ssf/2014/09/gov_christie_fiddles_while_rggi_money_burns_editorial.htm; Andrew Breiner, *The Plan To Get New Jersey Back Into RGGI That Gov. Christie Can't Veto*, THINKPROGRESS (Jul. 11, 2014), <http://thinkprogress.org/climate/2014/07/11/3459115/new-jersey-back-into-rggi/>.

³⁵² Interview with Bill Lamkin, Environmental Engineer, Massachusetts Department of Environmental Protection, in Cambridge, Mass. (Apr. 1, 2015).

³⁵³ *Id.*

³⁵⁴ William Funk, *Constitutional Implications of Regional CO₂ Cap-and-Trade Programs: The Northeast Regional Greenhouse Gas Initiative as a Case in Point*, 27 UCLA J. ENVTL. L. & POL'Y 353, 358-62 (2009).

this approach during the 2012 program review when the cap was nearly 45% higher than actual emissions, which fueled criticism that it was ineffective. Additionally, placing restrictions on imports of electricity from unconstrained jurisdictions can work to strengthen the program.³⁵⁵ Leveraging stakeholder relationships and managing expectations during this process can make these enforcing these adjustments a more streamlined process.

c) **The cap-and-trade program should be implemented in concert with broader energy efficiency measures and reinvestments that boost economic productivity.** For example, many companies tapped into incentive programs to install CHP systems to reduce CO₂ emissions. Along these lines, reducing time between revenue collection and spending toward economic and energy programs can boost the net present value of these investments on energy efficiency.³⁵⁶

³⁵⁵ Ian Sue Win & Marek Kolodziej, *The Regional Greenhouse Gas Initiative: Emission Leakage and the Effectiveness of Interstate Border Adjustments*, BOSTON UNIVERSITY STUDY, 9, available at http://people.bu.edu/isw/papers/rggi_leakage.pdf.

³⁵⁶ Paul J. Hibbard et al., *supra* note 339, at 47.

IV. CASE STUDIES: PLANNING AND ENVIRONMENTAL IMPACT ASSESSMENTS

A. MEPA GHG POLICY AND PROTOCOL (UNDER MGWSA)

1. Overview of System and Means of Implementation

MEPA requires all major projects that have state involvement to undergo an assessment of project impacts and alternatives to minimize and mitigate damage to the environment.³⁵⁷ In addition to this general process, certain projects are required to quantify their GHG emissions and identify measures or consider alternatives to reduce such emissions.³⁵⁸ This policy has been applied primarily to commercial and residential real estate but is also applied to industrial and energy projects.³⁵⁹ The MEPA review process requires an impact and alternatives assessment in the early stage of project planning, allowing project proponents the opportunity to integrate sustainable design considerations into the rest of the project in the most economical manner.³⁶⁰ The MEPA Office coordinates the review of projects, with numerous agencies participating in the process.³⁶¹ The interagency collaboration between the Department of Environmental Protection, Department of Transportation, the Department of Energy Resources, the Historical Commission, regional planning agencies and municipal agencies has been successful under the MEPA GHG Policy framework.³⁶²

The MEPA Office is also in the process of incorporating adaptation into the project review process. MGWSA amended the MEPA statute to require the consideration of “reasonably foreseeable climate change impacts, including additional GHG emissions and effects, such as predicted sea level rise.”³⁶³ In November 2014, the Executive Office of Energy and Environmental Affairs drafted the MEPA Climate Change Adaptation and Resiliency Policy.³⁶⁴ This policy addresses impacts associated with sea level rise, changes in precipitation, and changes in temperature.³⁶⁵ The assessment will evaluate how the project site and proposed infrastructure may be impacted by such changes and how the project itself contributes to or reduces such impacts.³⁶⁶ The assessment will identify potential project vulnerabilities under predicted future climate conditions, including the impact on existing and proposed structures, coastal infrastructure, transportation facilities, public space, wetlands and other coastal natural resources, and effects on adjacent land use.³⁶⁷ The impact of temperature increase on energy demand will overlap with the traditional analysis

³⁵⁷ MASS. CLEAN ENERGY AND CLIMATE PLAN FOR 2020, *supra* note 166, at 81.

³⁵⁸ *Id.*

³⁵⁹ *Id.*

³⁶⁰ *Id.*

³⁶¹ See MGWSA 5-YEAR PROGRESS REPORT, *supra* note 162, at 23.

³⁶² *Id.*

³⁶³ See DRAFT MEPA ADAPTATION POLICY, *supra* note 171, at 1.

³⁶⁴ *Id.*

³⁶⁵ *Id.*

³⁶⁶ *Id.* at 2.

³⁶⁷ *Id.* at 6.

of GHG emissions.³⁶⁸ Climate change impacts should be part of the consideration when determining the design and location of the infrastructure and other relevant components of the project.³⁶⁹ Proponents should implement site and project specific mitigation, resiliency and adaptation measures upon construction and also additional measures in the future to adapt to changing climate conditions.³⁷⁰ See Appendix C for the list of specific adaptation measures contained in the Draft Policy for project proponents to consider.

2. Implementation Results

The MEPA review process has become a routine part of the environmental review of projects in Massachusetts, and it is generally accepted by industry groups and the public.³⁷¹ From 2008-2012, 58 projects completed MEPA review, and adding GHG emissions to the review process resulted in commitments to alternatives that will prevent over 83,000 metric tons of CO₂e emissions per year.³⁷² MEPA review is ongoing for more than 100 projects, and is expected to generate additional emissions reductions over the next five years.³⁷³ The incorporation of climate change adaptation into the MEPA review process is still in progress, but it is expected to increase the resiliency of new developments in the state to expected climate change impacts, such as intense storms and rising sea levels.

B. NEW YORK'S COMMUNITY RISK AND RESILIENCY ACT

The Community Risk and Resiliency Act (“CRRA”) was signed into law in September 2014.³⁷⁴ CRRA is intended to increase New York’s preparedness for the effects of climate change and protect communities from severe weather and sea level rise.³⁷⁵ The law requires agencies to consider the future impacts of climate risks from storm surges, sea level rise, and flooding when planning, approving, and funding infrastructure projects.³⁷⁶ Permitting and funding decisions are conditioned on such assessments. Under the state’s Environmental Quality Review Act, agencies are already required to consider the impacts of future projects on climate change and the extent to which GHG emissions would be increased.³⁷⁷ Complementary to this review, CRRA requires assessments of impacts of climate risks on future projects.³⁷⁸ This requirement extends to projects in all sixty-two counties in the state of New York that receive state assistance payments.³⁷⁹

³⁶⁸ *Id.* at 7.

³⁶⁹ *Id.* at 6.

³⁷⁰ *Id.* at 8.

³⁷¹ See MASS. CLEAN ENERGY AND CLIMATE PLAN FOR 2020, *supra* note 166, at 81.

³⁷² See MGWSA 5-YEAR PROGRESS REPORT, *supra* note 162, at 63.

³⁷³ *Id.* at 23.

³⁷⁴ *New York Community Risk and Resilience Act*, GEORGETOWN CLIMATE CENTER, <http://www.georgetownclimate.org/resources/new-york-community-risk-and-resiliency-act>.

³⁷⁵ *Id.*

³⁷⁶ *Id.*

³⁷⁷ Client Alerts: New York Community Risk and Resiliency Act, Venable LLP (Oct. 10, 2014), <https://www.venable.com/new-york-community-risk-and-resiliency-act-10-10-2014/>.

³⁷⁸ N.Y. Env'tl. Conserv. Law § 8 (McKinney).

³⁷⁹ *New York Community Risk and Resilience Act*, GEORGETOWN CLIMATE CENTER, <http://www.georgetownclimate.org/resources/new-york-community-risk-and-resiliency-act>.

1. Key Elements of the Act

CRRA requires consideration of future physical climate risk due to sea level rise, storm surges, and flooding, based on available data predicting the likelihood of future extreme weather events, in these subject areas:

- State funding for agricultural land protection;
- Proposing and compiling petroleum bulk storage requirements;
- Smart growth public infrastructure criteria
- Water pollution revolving loan fund;
- Oil and gas well permits;
- Siting of hazardous waste facilities;
- Bulk storage of hazardous substances;
- Land acquisition for preservation of open space; recreation; and natural, cultural and historic resources;
- State assistance for closure of non-hazardous municipal landfills;
- State assistance for local waterfront revitalization programs and coastal rehabilitation projects; and
- Drinking water revolving fund.³⁸⁰

Another feature of CRRA directs the New York Department of State to work with the State Department of Environmental Conservation to develop model climate change adaptation zoning laws for use by municipalities, and to provide additional guidance on the utilizing natural resources and natural resources as resiliency measures to reduce risk.³⁸¹

CRRA came into effect on March 21, 2015, and will only apply to all permit applications after the adoption of guidance on its implementation, which will be released no later than January 1, 2017.³⁸²

C. KEY TAKEAWAYS

Although Massachusetts and other states have been incorporating mitigation into environmental impact assessments for several years now, states are just beginning to incorporate adaptation into these procedures. Bringing climate change into these existing procedures has proved to be a valuable tool for addressing climate change:

a) Integrating climate change considerations into environmental review procedures has benefits for both adaptation and mitigation. Massachusetts reports success in influencing project proponents to design their projects in ways that reduce GHG emissions.³⁸³ New policies in New York and Massachusetts also suggest that this process can be used to raise awareness among developers of the importance of incorporating

³⁸⁰ N.Y. Envtl. Protection, Sess. Law News of N.Y. § 6617-B (McKinney 2014).

³⁸¹ *Id.*

³⁸² Client Alerts: New York Community Risk and Resiliency Act, Venable LLP (Oct. 10, 2014), <https://www.venable.com/new-york-community-risk-and-resiliency-act-10-10-2014/>.

³⁸³ See MGWSA 5-YEAR PROGRESS REPORT, *supra* note 162, at 63.

adaptation into their designs. Given China's experience in implementing its existing environmental impact assessment form/report program for every new project (including incorporation of manufacturing and other companies), integrating climate change consideration into such assessment program may be an efficient alternative.

b) Although climate change impacts will vary by location, environmental impact assessment policies that cover large areas can still require developers to address the issues that are relevant to their project. The policy can put the onus on the developer to assess what the vulnerabilities are for area of the project (although it helps to provide technical assistance in obtaining this information). Furthermore, while some states have focused only on areas that are the most vulnerable (e.g. coastal areas), it is important to have developers everywhere consider climate change impacts to help build awareness of expected impacts like droughts and increased precipitation that are not as obvious as sea levels rise.

c) Using environmental impact assessments to require the consideration of climate change enables the government to encourage action when it is least costly to do so—at the design stage of the project. In addition, the fact that developers must obtain a permit of certificate of compliance after submitting the environmental impact statement gives the government more leverage that it may have later when the stakes are higher. As mentioned above, given China's own practice of implementing its existing environmental impact assessment form/report program, this take-away may provide advisable guidance.

V. CASE STUDIES: REGISTRATION, MONITORING, AND EVALUATION

A. MANDATORY REPORTING OF GHGS RULE

EPA promulgated the Mandatory Reporting of Greenhouse Gases Rule (the “MRGG Rule”) to require reporting of GHG emissions from all sectors of the economy. The MRGG Rule applies to fossil fuel suppliers and industrial gas suppliers, direct GHG emitters, and manufacturers of heavy-duty and off-road vehicles and engines. The MRGG Rule does not require control of GHG emissions; rather it requires only that sources above certain thresholds monitor and report their emissions.

1. Background

a) **Legal Authority:** EPA promulgated the MRGG Rule under its existing authority under the CAA.³⁸⁴ CAA Section 114(a)(1) authorizes the EPA Administrator to require emissions sources, persons subject to the CAA, or persons whom the Administrator believes may have necessary information to monitor and report emissions and provide such other information the Administrator requests.³⁸⁵ CAA Section 208 provides EPA with similarly broad authority regarding the manufacturers of new motor vehicles or new motor vehicle engines.³⁸⁶

b) **Public Comments and Transparency:** EPA proposed the MRGG Rule on April 10, 2009.³⁸⁷ EPA held two public hearings, and received approximately 16,800 written public comments.³⁸⁸ The public comment period ended on June 9, 2009.³⁸⁹ In addition to the public hearings, EPA has met with over 4,000 people and 135 groups.³⁹⁰ Details of these meetings are publicly available.³⁹¹

c) **Relationship to Other Climate Policies and Programs:** The MRGG Rule supplements and complements existing U.S. government programs. For example, facility-level GHG emissions data collected under the MRGG Rule will lead to improvements in the quality of the Inventory of U.S. Greenhouse Gas Emissions and Sinks (“Inventory”). EPA uses this Inventory to fulfill its obligations under the United National Framework Convention on Climate Change (“UNFCCC”) to “develop, periodically update, publish and make available...national inventories of anthropogenic emissions by sources and

³⁸⁴ Mandatory Reporting of Greenhouse Gases Rule, 74 Fed. Reg. 56260, 56264 (Oct. 30, 2009).

³⁸⁵ *Id.* at 56265; *see also* Clean Air Act § 114(a)(1), 42 U.S.C. § 7414.

³⁸⁶ Mandatory Reporting of Greenhouse Gases Rule, *supra* note 384, at 56265; *see also* Clean Air Act § 208, 42 U.S.C. § 7528.

³⁸⁷ Mandatory Reporting of Greenhouse Gases Rule, *supra* note 384, at 56264.

³⁸⁸ *Id.*

³⁸⁹ *Id.*

³⁹⁰ *Id.*

³⁹¹ To view details of these meetings, as well as public comments, search “EPA-HQ-OAR-2008-0508” at www.regulations.gov. Search results directly available at <http://www.regulations.gov/#!searchResults:rpp=25;po=0;s=EPA-HQ-OAR-2008-0508;det=PS>.

removals by sinks of all greenhouse gases...³⁹² EPA prepares the Inventory annually and submits it to the Secretariat of the UNFCCC.³⁹³

The MRGG Rule has broader coverage of U.S. GHG emissions than most voluntary programs (e.g., Climate Leaders, the Natural Gas STAR program, Energy Star), which typically focus on one specific industry and/or goal. This MRGG Rule aims to improve EPA's understanding of emissions from facilities not currently included in the existing programs and to increase coverage of different industries.³⁹⁴ In the long run, this MRGG Rule can provide crucial information necessary to inform policies that address climate change.³⁹⁵

2. Overview of the Rule and Means of Implementation

a) Applicability: EPA divides sources into different categories for purposes of regulating them under the CAA. The MRGG Rule references these categories, requiring them to submit annual, ongoing GHG reports. The applicability is assessed on the basis of a facility's annual emissions or a supplier's annual quantity of product supplied.

Specifically, the MRGG Rule applies to any facility that contains any source category including electricity generation, cement production, petroleum refineries, and municipal solid waste landfills, among others.³⁹⁶ The MRGG Rule also covers any facility that produces glass, iron, steel, and lead and emits 25,000 metric tons CO₂e or more per year.³⁹⁷ For suppliers, the annual GHG report covers all applicable products including but not limited to coal-to-liquid fuels, petroleum products, natural gas liquids, industrial GHGs, and CO₂.³⁹⁸ R&D activities are not considered to be part of any source category subject to the MRGG Rule.³⁹⁹

b) Content: In addition to basic profile information, reporting facilities must include detailed emission data in each annual GHG report.⁴⁰⁰ Facilities that directly emit GHGs must include annual facility emissions, expressed in metric tons of CO₂ e per year, aggregated for all GHGs from all source categories that are located at the facility.⁴⁰¹ Some source categories require reporting for each individual unit or each process line.⁴⁰² Activity

³⁹² United National Framework Conventions on Climate Change, art. 4(1)(a); U.S. GHG INVENTORY 2013 EXECUTIVE SUMMARY 1 (2013), available at <http://www.epa.gov/climatechange/Downloads/ghgemissions/US-GHG-Inventory-2013-ES.pdf>.

³⁹³ Mandatory Reporting of Greenhouse Gases Rule, *supra* note 384, at 56265.

³⁹⁴ *Id.*

³⁹⁵ *Id.* at 56266.

³⁹⁶ *See* Mandatory Reporting of Greenhouse Gases Rule, *supra* note 384, at 56266-67 for more details.

³⁹⁷ *Id.*

³⁹⁸ *See id.* at 56267 for more details.

³⁹⁹ *Id.*

⁴⁰⁰ *Id.* at 56268.

⁴⁰¹ *Id.*

⁴⁰² *Id.*

data (e.g., fuel use, feedstock inputs) that were used to generate the emissions data are also included to support emissions verification.⁴⁰³

Suppliers must submit annual quantities of each GHG that would be emitted from combustion or use of the products supplied.⁴⁰⁴ Suppliers also report the total quantity, expressed in metric tons of CO₂e, aggregated for all GHGs from all applicable supply categories.⁴⁰⁵ Additional data specified in the applicable subparts for each supply category include data used to calculate GHG quantities or needed to support data verification.⁴⁰⁶ Suppliers also need to provide a written explanation if the reporter changes or is using different GHG calculation methodologies during the reporting period.⁴⁰⁷

c) Submission: The GHG reports must be submitted electronically. On behalf of the owners and operators, the Designated Representative of every facility or supplier must certify under penalty of law that the report has been prepared in accordance with the requirements of this program and that the information contained in the report is true and accurate.⁴⁰⁸ Reporting facilities must retain the data used to generate the annual GHG report and make them available to EPA upon request for three years from the date of the report.⁴⁰⁹

Electronic reporting has many advantages, including a “reduced burden on [reporting facilities] and EPA staff, greater accuracy, enhanced ability to conduct electronic audits to ensure data quality, improved comparability, and improved data availability for EPA and the public.”⁴¹⁰

d) Compliance and Enforcement: To facilitate compliance, EPA developed implementation and outreach materials to help facilities understand applicability, reporting requirements, and timetables.⁴¹¹ Examples of these materials include “frequently asked question and answer” documents, sample reporting forms, an applicability tool, and information sheets on technical details and implementation by sector.⁴¹² The assistance is particularly directed to industrial, commercial, and institutional sectors that do not routinely deal with air pollution regulations.⁴¹³ EPA also created online assistance centers.⁴¹⁴

⁴⁰³ *Id.*

⁴⁰⁴ *Id.*

⁴⁰⁵ *Id.*

⁴⁰⁶ *Id.*

⁴⁰⁷ *Id.*

⁴⁰⁸ *Id.*

⁴⁰⁹ *Id.* at 56269.

⁴¹⁰ *Id.* at 56594.

⁴¹¹ These materials are publicly available through an online help center. *See Greenhouse Gas Reporting Program: Help Center*, U.S. ENVIRONMENTAL PROTECTION AGENCY, <http://www.epa.gov/ghgreporting/help/index.html>.

⁴¹² *Id.*

⁴¹³ Mandatory Reporting of Greenhouse Gases Rule, *supra* note 384, at 56360.

⁴¹⁴ *E.g. Greenhouse Gas Reporting Program's FAQ Site*, U.S. ENVIRONMENTAL PROTECTION AGENCY, <http://www.ccdsupport.com/confluence/display/faq/FAQs>.

States may have reporting programs that are broader in scope or more aggressive in implementation than the MRGG Rule.⁴¹⁵ In concert with their routine inspection and other compliance and enforcement activities for other CAA programs, state and local agencies also can assist with educating facilities and assuring compliance at facilities subject to the MRGG Rule.⁴¹⁶ At this time, however, EPA does not formally delegate implementation of the MRGG Rule to state and local agencies.⁴¹⁷ Even without delegation, EPA is committed to working with states to ease the burden on reporting facilities by harmonizing data management, where possible.⁴¹⁸ Further, EPA is proposing to make the data collected under the MRGG Rule available to states and other interested parties as soon as possible.⁴¹⁹

Facilities that fail to report GHG emissions according to the requirements of the MRGG Rule could potentially be subject to enforcement action by EPA under CAA §§ 113 and 203-205.⁴²⁰ The CAA allows for injunctive relief to compel compliance and civil and administrative penalties of up to \$32,500 per day.⁴²¹ Deviations from the MRGG Rule that could ultimately be considered violations include but are not limited to: failure to report GHG emissions and continuously monitor as required; failure to keep records needed to verify GHG emissions estimates; failure to estimate GHG emissions according to the methodology specified in the rule; falsification of reports.⁴²²

e) **Verification:** EPA intends to review the annual GHG reports submitted under the MRGG Rule by performing electronic data quality assurance (“QA”) checks.⁴²³ When EPA finds reporting errors, the reporting facility is notified and must submit a revised report within 45 days.⁴²⁴

EPA requires self-certification with EPA emissions verification.⁴²⁵ This verification approach provides greater assurance of accuracy and impartiality than self-certification without verification.⁴²⁶ First, EPA conducts an initial centralized review of the data through an electronic data QA program for use by reporting facilities and EPA to assure the completeness and accuracy of data.⁴²⁷ In addition, EPA may review facility-level monitoring plans and procedures, and perform checks on data utilizing recent and historical data submittals to ensure consistency.⁴²⁸ Second, EPA intends to follow-up with reporting

⁴¹⁵ Mandatory Reporting of Greenhouse Gases Rule, *supra* note 384, at 56595.

⁴¹⁶ *Id.*

⁴¹⁷ *Id.*

⁴¹⁸ *Id.*

⁴¹⁹ *Id.*

⁴²⁰ *Id.*

⁴²¹ *Id.*

⁴²² *Id.* at 56596.

⁴²³ *Id.*

⁴²⁴ *Id.*

⁴²⁵ *Id.* at 56282.

⁴²⁶ *Id.*

⁴²⁷ *Id.*

⁴²⁸ *Id.*

facilities should potential errors or discrepancies arise through the review and conduct on-site audits of selected facilities.⁴²⁹

This verification approach also enables EPA to collect data more quickly than under a third-party verification approach.⁴³⁰ The third-party verification approach could take several months after initial data submission, and EPA would still need to review and perform consistency checks after the third-party verification was complete.⁴³¹ In addition, EPA would have to establish and develop verification protocols to qualify and accredit the third-party verifiers, and to administer a process to ensure that the verifiers do not have conflicts of interest with the facilities.⁴³² Such a program could require EPA to review numerous conflict of interest screening decisions each time a reporter hires a third-party verifier.⁴³³

3. Implementation Results

a) Economic Impacts: The costs of complying with the MRGG Rule vary from one facility to another, depending on the “types of emissions, the number of affected sources at the facility, existing monitoring, recordkeeping, reporting activities at the facility, and other factors.”⁴³⁴ EPA’s estimated costs of compliance are based on labor costs and equipment costs.⁴³⁵ Labor costs are the costs of complying with and administering this rule, including time of managers, technical, and administrative staff.⁴³⁶ Equipment costs include both the initial purchase price of monitoring equipment and any facility/process modification that may be required.⁴³⁷

EPA prepared Regulatory Impact Analysis to evaluate the impacts of the MRGG Rule on affected industries.⁴³⁸ According to the analysis, overall national costs of the MRGG Rule are significant because there are a large number of affected entities, but per-entity costs are low.⁴³⁹ Thus the MRGG Rule is unlikely to significantly affect firms’ production decisions or prices in affected markets.⁴⁴⁰

b) Emissions Trends: In 2013, 7,865 direct emitters reported 3.18 billion metric tons CO₂e in their GHG reports.⁴⁴¹ “The largest emitting sector was the power plant sector with 2.1 billion metric tons CO₂e, followed by the petroleum and natural gas systems sector

⁴²⁹ *Id.*

⁴³⁰ *Id.* at 56283.

⁴³¹ *Id.*

⁴³² *Id.*

⁴³³ *Id.*

⁴³⁴ *Id.* at 56361.

⁴³⁵ *Id.*

⁴³⁶ *Id.*

⁴³⁷ *Id.* For example, the cost estimation method for mobile sources involves upstream measurement by the vehicle manufacturers. This may require an upgrade to their test equipment and facility.

⁴³⁸ *Id.* at 56597.

⁴³⁹ *Id.*

⁴⁴⁰ *Id.*

⁴⁴¹ *GHGRP 2013: Reported Data*, U.S. ENVIRONMENTAL PROTECTION AGENCY, <http://www.epa.gov/ghgreporting/ghgdata/reported/index.html>.

with 224 million metric tons (MMT) CO₂e and the petroleum refinery sector with 177 MMT CO₂e.”⁴⁴²

According to the Inventory, total U.S. emissions decreased by 3.4% from 2011 to 2012.⁴⁴³ Over the past three reporting years (2011-2013), emissions reported under this rule have declined by 3.9%.⁴⁴⁴ This decline is caused primarily by a 5.4% decline in reported emissions by power plants. Since 2010, emissions from power plants have decreased by 9.8%.⁴⁴⁵

It is important to keep in mind that the MRGG Rule does not aim to directly impact emissions trends. No part of the MRGG Rule requires reporting facilities to install any technologies or to attempt to reduce their emissions. However, the MRGG Rule allows EPA to monitor the nationwide emissions trend, so that the data can be used to support the development of potential future climate policies or programs in the long run. In addition, companies can monitor their emissions as they participate in the mandatory reporting process, and the information they collect may help them do the GHG reduction planning now.⁴⁴⁶

B. THE CLIMATE REGISTRY

The Climate Registry (“TCR”) is a non-profit organization formed and governed U.S. states and Canadian provinces and territories that desired to monitor and track their GHG emissions prior to EPA’s issuance of the Mandatory Reporting of GHGs Rule.⁴⁴⁷ It designs and operates voluntary and compliance GHG reporting programs globally and assists organizations in measuring, verifying, and reporting the carbon in their operations so they can manage and reduce it.⁴⁴⁸ Directors have signed TCR’s mission statement to support common GHG measurement and reporting standards.⁴⁴⁹ A key part of TCR’s value is providing third-party verification of emissions data and reporting.⁴⁵⁰

⁴⁴² *Id.*

⁴⁴³ *Id.*

⁴⁴⁴ *Id.*

⁴⁴⁵ *Id.*

⁴⁴⁶ Monica Trauzzi, *EPA: Former EPA climate director Kruger discusses future of air rules, GHG reporting program*, E&E NEWS, Sept. 13, 2011.

⁴⁴⁷ Janet Wilson, *31 states to track warming*, LA TIMES, May 9, 2007, available at <http://articles.latimes.com/2007/may/09/nation/na-greenhouse9>; THE CLIMATE REGISTRY, <http://www.theclimateregistry.org>.

⁴⁴⁸ THE CLIMATE REGISTRY, <http://www.theclimateregistry.org>.

⁴⁴⁹ *Who We Are: Board of Directors*, THE CLIMATE REGISTRY, <http://www.theclimateregistry.org/who-we-are/board-of-directors/jurisdiction>.

⁴⁵⁰ Janet Wilson, *31 states to track warming*, LA TIMES, May 9, 2007, available at <http://articles.latimes.com/2007/may/09/nation/na-greenhouse9>.

1. Programs

Membership with TCR is open to all legal entities that submit and comply with the Membership Agreement.⁴⁵¹ Membership fees are assessed on an annual basis from the date of membership, and vary from \$750 to \$5,500 for non-profit, government, and academic organizations and from \$1,000 to \$22,000 for commercial and industrial organizations.⁴⁵² Some businesses that join TCR tout it as part of their sustainability and corporate social responsibility initiatives. It allows companies that have set voluntary emissions reduction goals for their operations to track and verify their progress, which they can then market to consumers and investors that are concerned about climate change.⁴⁵³

TCR has established various programs with its members in the public and private sectors, providing them with technical support for GHG accounting, access to a community of leaders in climate change, and opportunities for recognition among the public. For example, Public Agency Leadership Program is a voluntary reporting program. It helps government agencies to measure and manage their GHG emissions from their own operations. Participants learn how to report their energy use and take steps to increase efficiency, reduce emissions, and lower operational costs.⁴⁵⁴

In California, CEPA uses the Public Agency Leadership Program to account for and report the use of natural gas, purchased electricity, and vehicle fuels including gasoline and diesel. Forty-five California agencies report their annual energy use through the Climate Registry Information System (“CRIS”). CRIS then converts each agency’s energy data into a GHG emissions footprint. CEPA uses the resulting energy and carbon footprints as a management tool for goal setting and GHG reduction targets.⁴⁵⁵ Similarly, the Minnesota Pollution Control Agency (“MPCA”) streamlines GHG reporting by linking existing state government buildings and fleet systems with CRIS. MPCA can aggregate energy and GHG emissions for state operations and set goals and reduction targets based on each agency’s individual emissions inventories.⁴⁵⁶

2. Reporting Protocols

TCR created numerous reporting protocols to provide its members with assistance in GHG calculation and reporting methodologies. The General Reporting Protocol (“GRP”) outlines TCR’s GHG accounting policies and required reporting calculation methodologies

⁴⁵¹ Applicants also need to provide up-to-date information that is true, accurate, and complete, and agree to the Membership Terms of Use, Website Terms of Use, and Privacy Policy.

⁴⁵² Fees are based on budgets for non-profit, government, and academic organizations and revenues for private entities. *Programs and Services: Voluntary Reporting: Membership Benefits & Options*, THE CLIMATE REGISTRY, <http://www.theclimateregistry.org/programs-services/voluntary-reporting/membership-benefits>.

⁴⁵³ E.g. Catherine Paquette, *Cisco Joins Prestigious Sustainability Organization*, CISCO BLOG, Sept. 10, 2014, available at <http://blogs.cisco.com/csr/cisco-joins-prestigious-sustainability-organization>.

⁴⁵⁴ *Programs and Services: Government Services: Public Agency Leadership Program*, THE CLIMATE REGISTRY, <http://www.theclimateregistry.org/programs-services/government-services/public-agency-leadership-program>.

⁴⁵⁵ *Id.*

⁴⁵⁶ *Id.*

for the majority of GHG sources. The GRP was developed through a comprehensive public stakeholder process that included over 1,140 individual comments from 107 respondents representing industry groups, environmental non-governmental organizations, regulatory agencies, individuals and consultants.⁴⁵⁷ TCR updates emission factors on an annual basis to reflect the most up-to-date knowledge about the components of energy.⁴⁵⁸ TCR designed other protocols as appendixes that are used in conjunction with the GRP. For example, the Electric Power Sector Protocol and Oil and Gas Production Protocol provide important supplemental reporting guidance and sector specific clarifications.⁴⁵⁹

C. KEY TAKEAWAYS

Registration, monitoring, and evaluation are essential components of any legal framework to address climate change. EPA's experience with the MRGG Rule and the role of TCR in helping states and private entities in this endeavor offer the following lessons for policymakers:

- a) **Monitoring and tracking emissions is foundational for any climate policy.** Having this information allows policymakers to identify where emissions are coming from and to assess whether certain policy interventions are leading to reductions. It also allows EPA to quantify the relative contribution of each gas to a certain source category and promulgate future regulations more effectively.⁴⁶⁰
- b) **Having public disclosure of the information produced through monitoring is also important.** On an annual basis, EPA publishes data submitted or collected under this rule through EPA's website, reports, and other formats.⁴⁶¹ This level of transparency informs the public and builds public confidence in climate policies.⁴⁶² Transparency also helps to facilitates greater data verification and review and ensure data quality.⁴⁶³
- c) **Nonprofit organizations can play an important role in facilitating the process of monitoring and reporting GHG emissions.** Technical assistance provided by TCR facilitates compliance with reporting requirements under EPA's rule. It can also utilize its expertise to promote effective, accurate, and uniform reporting among industries. Additionally, because these organizations are mainly funded through fees from members, the costs of compliance are internalized within the private sector. Leveraging China's recent experience of allowing nonprofit organizations to play more important roles in certain environmental protection areas, China may consider for nonprofit organizations to play some functions in the climate change front as well.

⁴⁵⁷ *Tools and Resources: Reporting Protocols: General Reporting Protocol*, THE CLIMATE REGISTRY, <http://www.theclimateregistry.org/tools-resources/reporting-protocols/general-reporting-protocol>

⁴⁵⁸ *Id.*

⁴⁵⁹ *Tools and Resources: Reporting Protocols: Electric Power Sector Protocol*, THE CLIMATE REGISTRY, <http://www.theclimateregistry.org/tools-resources/reporting-protocols/electric-power-sector-protocol>.

⁴⁶⁰ *Id.* at 56277.

⁴⁶¹ Mandatory Reporting of Greenhouse Gases Rule, *supra* note 384, at 56356.

⁴⁶² *Id.*

⁴⁶³ *Id.* at 56359.

VI. KEY RECOMMENDATIONS FOR CHINA

A. OVERVIEW OF CURRENT SITUATION IN CHINA

Economic growth and poverty alleviation have been the priority of China's development policy since economic reforms began in 1970s. Because energy is a key driver of economic growth, and China currently relies primarily on fossil fuels for energy, the Chinese government has historically not made the reduction of emissions a priority. The economic growth and living quality improvements associated with such growth will only accelerate the demand for energy, potentially driving GHG emissions even higher. In March 2015, the China Meteorological Administration ("CMA") noted the "huge impacts" that climate change could have on the country and stated that temperature increases in Mainland China over the past 100 years have exceeded the global average.⁴⁶⁴ In addition, China is estimated to experience a 3.5 degrees Celsius temperature increase annually by the end of the 21st century.⁴⁶⁵ Similar to the United States, the impacts of climate change on China are diverse because of the country's vast land size and distinctive geographies, ranging from high mountains in the southwest to low lying coastal areas in the east.

The deteriorating climate conditions show China's vulnerability to the adverse impacts of climate change. The diverse geography has only added complexity. According to CMA, increasing temperatures will lead to noticeable impacts on agriculture, such as reductions in crop yields, more frequent natural disasters, and an increase in sea level that threatens major economic zones.⁴⁶⁶ *Xinhua* reports that in 2014 Henan province, one of China's top grain producers, experienced a severe drought, which led to a loss of 7.3 billion RMB (USD \$1.2 billion) with agriculture constituting 97% of the losses.⁴⁶⁷ On the other end of the spectrum, southern China encountered a devastating flood, which killed at least 34 people and caused the loss of 5.21 billion RMB (USD \$839.8 million).⁴⁶⁸ Furthermore, the Yellow River delta is currently sinking as the sea level is increasing at 25 centimeters per year, representing almost 100 times the global average.⁴⁶⁹ Such coastal areas in the south and east are heavily populated and major economic growth drivers. Rising sea levels will result in negative social and economic impacts on coastal populations, which will also be likely to damage economic growth in the long run.⁴⁷⁰

⁴⁶⁴ Ari Phillips, *China's Top Meteorologist: 'Serious Threat' Of Climate Change Could Have 'Huge Impacts.'* THINKPROGRESS, Mar. 25, 2015, available at <http://thinkprogress.org/climate/2015/03/23/3637673/china-meteorologist-says-climate-change-serious-threat/>.

⁴⁶⁵ Alexandra Tracy et al., *The Impacts of Climate Change in Hong Kong and the Pearl River Delta*, 1 CHINA PERSPECTIVES [ONLINE] 2007, at 18-29, available at <http://chinaperspectives.revues.org/1173>.

⁴⁶⁶ Ari Phillips, *supra* note 464.

⁴⁶⁷ Tiezzi, Shannon, *In China, Climate Change Is Already Here*, THE DIPLOMAT, Aug. 14, 2014, available at <http://thediplomat.com/2014/08/in-china-climate-change-is-already-here/>.

⁴⁶⁸ *Id.*

⁴⁶⁹ Nicola Jones, *Rising Waters: How Fast and How Far Will Sea Levels Rise?*, YALE ENVIRONMENT 360, Oct. 21, 2013, available at http://e360.yale.edu/feature/rising_waters_how_fast_and_how_far_will_sea_levels_rise/2702/.

⁴⁷⁰ See generally David Anthoff et al., *The Economic Impact of Substantial Sea-Level Rise*, 15 MITIGATION & ADAPTATION STRATEGIES FOR GLOBAL CHANGE 321 (2010).

1. Domestic and International Policymaking Entities

The country's vulnerability and the scale of the problem create urgency for China to address climate change. Policymakers are making efforts to resolve the problem. So far, several legislative measures have been enacted, and progress has been made. There are multiple actors currently involved in climate change legislation.

Various ministries are in charge of formulating climate change policy, but with varying degrees of influence. The State Development Planning Commission, renamed the National Development and Reform Commission ("NDRC") in 2003, as the policy-making organ of the State Council, has been the chief ministry responsible for coordinating climate change policy since 1998.⁴⁷¹ In order to promote inter-ministerial collaboration, the National Climate Change Coordination Leading Small Group was established under NDRC in 2007.⁴⁷² The group is the highest climate change policy formulation entity in China.⁴⁷³ It is an inter-ministerial level committee chaired by Premier Li Keqiang and includes almost all ministers of the State Council.

NDRC is the primary entity for climate change governance.⁴⁷⁴ In addition to climate change policy, NDRC is China's most influential entity in terms of overall responsibility for economic development issues. NDRC is in charge of making economic policy, social development policy, and energy policy, including the formulation of China's five-year plan.⁴⁷⁵ It should be noted that the development agency, rather than the environmental agency, is currently responsible for writing climate change policy in China.

Although NDRC still plays the primary role, other ministries have increasing influence on shaping climate change policy. In 2007, the role of Special Representative for Climate Change Negotiation under the Ministry of Foreign Affairs was created.⁴⁷⁶ The Special Representative is in charge of organizing and participating in the international negotiation process, helping implement China's domestic plan, and demonstrating "the government's active participation in international cooperation on responding climate change."⁴⁷⁷ The Ministry of Finance plans to introduce a tax on carbon emissions as a part of environmental charges, while NDRC has been implementing carbon trading pilot programs, representing a competition for influence on climate change policy.⁴⁷⁸ NDRC's role has also been challenged by the Ministry of Environmental Protection, whose responsibilities were

⁴⁷¹ Gørild Heggelund, *China's climate change policy: domestic and international developments*, 31 ASIAN PERSPECTIVE 155, 168 (2007).

⁴⁷² *Main Functions of the NDRC*, NATIONAL DEVELOPMENT AND REFORM COMMISSION, <http://en.ndrc.gov.cn/mfndrc/>.

⁴⁷³ Gørild Heggelund, *supra* note 471, at 168.

⁴⁷⁴ Lisa Williams, *China's Climate Change Policies: Actors and Drivers*, LOWY INSTITUTE FOR INTERNATIONAL POLICY (July 24, 2014).

⁴⁷⁵ *Id.*

⁴⁷⁶ *Special Representative for Climate Change Negotiations of the Ministry of Foreign Affairs Yu Qingtai Receives Interview of the Media*, MINISTRY OF FOREIGN AFFAIRS OF CHINA (Sept. 22, 2007), <http://www.mfa.gov.cn/ce/celt/eng/xwdt/t366696.htm>.

⁴⁷⁷ CLIMATE CHANGE SCIENCE AND POLICY 299 (Stephen H. Schneider ed., 2009).

⁴⁷⁸ Qiang Hou, *China to Introduce Carbon Tax*, XINHUA NEWS AGENCY, Feb. 19, 2013, available at http://news.xinhuanet.com/english/china/2013-02/19/c_132178898.htm.

focused on other types of pollution such as air, soil, and water.⁴⁷⁹ As air pollution mitigation becomes a task with higher priority for the government, and the combustion of fossil fuel based energy resources remains the major source of both climate change and air pollution, the Ministry of Environmental Protection will likely become involved in climate change policymaking process. Nevertheless, NDRC will still be the primary policy maker in climate change due to its responsibility for coordination among key players from various ministries.

2. Existing Measures to Confront Climate Change

While China continues to face challenges in mitigating energy and environmental problems while securing sustainable development, it has enacted several legislative measures proposed by NDRC to reduce GHG emissions. *Table 6* outlines these measures.

Table 6: Legislative Measures to Reduce GHG Emissions in China

Eleventh Five Year Plan (2005-2010)	First national five-year plan that included policy focused on reducing energy intensity. ⁴⁸⁰ Set a target of reducing energy consumption per unit of GDP by 20% below the level of 2005 by 2010. NDRC was responsible for overseeing the target. More specific steps to realize the target included readjusting the economic structure and promoting the environmental technology and protection industry. ⁴⁸¹
National Climate Change Program (published by NDRC in 2007)	Intended to control GHG emissions, and enhance the capability of continuous adaption to climate change through five methods: encouraging GHG emissions mitigation; promoting adaption; developing climate change science and technology; raising public awareness on climate change issues; and strengthening institutional innovation and mechanism development. ⁴⁸²
Twelfth Five Year Plan (2011-2015)	Specified a goal to reduce carbon emissions per unit of GDP by 17%, in addition to a 16% reduction in energy consumption per unit of GDP by 2015 compared to the level of 2010.

⁴⁷⁹ *Main Mandate of State Environmental Protection Administration: Mission*, MINISTRY OF ENVIRONMENTAL PROTECTION PEOPLE'S REPUBLIC OF CHINA (04 July 2007).

⁴⁸⁰ *Energy Intensity Target of the 11th Five Year Plan*, INDUSTRIAL EFFICIENCY POLICY DATABASE, <http://iepd.iipnetwork.org/policy/energy-intensity-target-11th-five-year-plan>.

⁴⁸¹ 国务院关于落实《中华人民共和国国民经济和社会发展第十一个五年规划纲要》主要目标和任务分工的通知, MINISTRY OF LABOR AND SOCIAL SECURITY OF CHINA (Aug. 24, 2006), available at http://www.sdpc.gov.cn/fzgggz/fzgh/zcfg/200611/t20061107_92225.html; Letian Pan, Premier Wen Highlights Environmental Protection, GOV.CN (Apr. 18 2006), available at http://www.gov.cn/english/2006-04/18/content_257145.htm.

⁴⁸² NATIONAL DEVELOPMENT AND REFORM COMMISSION, CHINA'S NATIONAL CLIMATE CHANGE PROGRAM 30-57 (June 2007), available at <http://www.ccchina.gov.cn/WebSite/CCChina/UpFile/File188.pdf>.

China's Policies and Actions on Climate Change (drafted and published by NDRC in 2014)	Aimed at making sure China meets its 2020 Copenhagen commitments of achieving 40% to 50% of carbon emissions reduction per unit of GDP, and driving economic growth in a sustainable way. ⁴⁸³
----------------------------------------------------------------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

In November 2014, China announced its goal for carbon emissions to peak by 2030 and then start to decline.⁴⁸⁴ Carbon trading is one of the major strategies it intends to use to reduce domestic carbon emissions. So far, China has launched carbon trading pilot programs in seven markets including Beijing and Shanghai.⁴⁸⁵ Three longer-running pilot programs in Guangzhou, Shanghai, and Shenzhen have achieved significant progress. Shanghai reached 100% compliance rate, while only four out of 635 industrial firms in Shenzhen failed to comply and two out of 184 failed to comply in Guangdong by the compliance deadline.⁴⁸⁶ Earlier this year, NDRC published a national market plan for carbon trading called “Regarding the Fundamental Conditions and Operational Thinking Behind the Promotion and Establishment of the National Carbon Emissions Rights Trading Market.”⁴⁸⁷ The objective is to set emissions caps and allocate carbon credits under a national framework, with the goal of developing a roadmap for how China would achieve such objectives on a nationwide scale. In addition, during the pilot programs period, the Ministry of Finance announced its plan to introduce carbon tax on GHGs, but with no specific timetable. The State Council will be in charge of enforcing compliance.⁴⁸⁸

Energy is essential to generate economic growth, and reliance on fossil fuels is one of the major factors contributing to the deteriorating climate change situation in China—as well as its acute air pollution problem. Thus energy regulation is an important component of formulating effective measures to reduce GHG emissions. Since the establishment of the country until the late 1970s, energy regulations were a part of the planned economic model.⁴⁸⁹ Because the energy market and the government were intertwined, there was no need for separate energy market regulations.⁴⁹⁰ Rather, regulations took the form of production plans and administrative orders during this period.⁴⁹¹ Since the 1978 economic

⁴⁸³ Kaihong Hu, *SCIO Briefing: China Policies and Actions on Climate Change*, CHINA.ORG.CN., Nov. 25, 2014, available at http://china.org.cn/china/2014-11/25/content_34143490.htm.

⁴⁸⁴ Edward Wong, *China's Climate Change Plan Raises Questions*, N.Y. TIMES, Nov. 12, 2014.

⁴⁸⁵ Lisa Murray, *China Brings Forward Carbon Permits Plan*, FINANCIAL REVIEW, Sept. 1, 2014, available at <http://www.afr.com/markets/commodities/energy/china-brings-forward-carbon-permits-plan-20140901-jdmov>.

⁴⁸⁶ Clayton Munnings et al., *Assessing the Design of Three Pilot Programs for Carbon Trading in China*, RESOURCES FOR THE FUTURE DISCUSSION PAPER 14-36, 31 (Oct. 2014), available at <http://www.rff.org/RFF/Documents/RFF-DP-14-36.pdf>.

⁴⁸⁷ Peter Zaman et al., *China Outlines Plans for Its Carbon Trading Markets*, REED SMITH LLP, Feb. 20, 2015, available at <http://www.reedsmith.com/China-Outlines-Plans-for-its-Carbon-Trading-Markets-02-20-2015/>.

⁴⁸⁸ CDC CLIMAT RESEARCH & IETA, CHINA: AN EMISSIONS TRADING CASE STUDY 13 (Mar. 2015).

⁴⁸⁹ Xin Qiu and Hongli Li, *Energy Regulation and Legislation in China*, 42 ENVIRONMENTAL LAW REPORTER: NEWS & ANALYSIS 10678, 10678 (2012).

⁴⁹⁰ *Id.*

⁴⁹¹ *Id.*

reforms, China has transformed from a planned economy to a market economy, and the central government is moving toward a market-based pricing approach.⁴⁹² As China realized the high environmental costs of rapid economic development, policymakers began to introduce energy regulatory measures with an emphasis on sustainable development.⁴⁹³ In 2005, the Renewable Energy Law was implemented in an effort to reduce energy reliance on coal-centered resources, and encourage the adoption of renewable energy.⁴⁹⁴ In 2013, China announced its plan to accelerate energy pricing reform to encourage competition and energy use efficiency.⁴⁹⁵

Reluctance to enforce and comply: In order to realize its goal of carbon emissions, China has to balance its primary focus on economic growth with environmental goals. The central government will be responsible for establishing and issuing new legislation as well as exercising supervision and enforcement.⁴⁹⁶ In reality, the central government may face challenges in convincing local authorities at the provincial and regional levels to enforce environmental regulations. The challenges come from emitters in the first place. Many companies are not used to the mentality of environmental protection, do not understand the necessity of compliance, and simply assume the government is trying to make money. In China, it is unlikely that climate change initiatives in the form of proposed legislation will face opposition or constitutionality challenges, as happened in the United States; however, it is likely that more challenges could be presented during the implementation of climate change rules.

Further, as reported, sometimes local authorities may tend to prioritize economic growth over environmental protection. Historically, the underlying reason may partly lie in the performance evaluation system for governmental officials, which did not include environmental and climate indicators until the Eleventh Five Year Plan.⁴⁹⁷ Even now, in practice, some implementers of the evaluation system may put more emphasis on economic growth than on environmental goals. Another reason may lie in that the local governments still need more understanding and knowledge of climate change issues as well as the urgency and necessity of tackling this problem.⁴⁹⁸

⁴⁹² *Id.* at 10679.

⁴⁹³ Xin Qiu and Hongli Li, *supra* note 492, at 10679.

⁴⁹⁴ *Id.* The Administrative Department of Energy within the State Council is responsible for overseeing implementation at the national level, whereas the Administrative Departments Responsible for Energy Work of the local governments above the county level is in charge of implementation in their respective administrative regions. *Renewable Energy Law of the People's Republic of China*, MINISTRY OF COMMERCE (Dec. 20, 2013), <http://english.mofcom.gov.cn/article/policyrelease/questions/201312/20131200432160.shtml>.

⁴⁹⁵ Fayen Wong and Judy Hua, *China Looks to Energy Price Reform to Unlock Gas Supply, Cut Waste*, REUTERS, Nov. 15, 2013, available at <http://www.reuters.com/article/2013/11/15/china-energy-reform-idUJSL4N0J00PT20131115>.

⁴⁹⁶ *Id.* at 12.

⁴⁹⁷ Lisa Williams, *supra* note 474, at 11;

陈涛. "“十一五”发展的主要目标之三——资源利用效率显著提高." 国务院办公厅. 中国政府网, Mar. 18, 2006.

⁴⁹⁸ Lisa Williams, *supra* note 474, at 12.

In addition, the discrepancy of economic development levels across China contributes to this challenge. Relatively more developed coastal areas in the east have been willing to adopt the new legislation because governments respond with more detailed measures after receiving increasingly acute demand from citizens on environmental protection, and emitters are likely more able to afford higher technology to mitigate emissions. The question is whether the less developed inland areas will follow the environmental targets, as many of them may be dependent on heavy industry and power plants.⁴⁹⁹

The central government has made progress in terms of establishing monitoring, reporting, and verification (“MRV”) mechanisms in carbon trading pilot programs. But there is still room to improve the transparency on how MRV should be executed.

Low-carbon growth leads to sustainable development and cleaner air: China’s new focus on climate change and its commitments on carbon emissions promise to reduce the nation’s reliance on coal as the major energy source. The underlying challenge is that due to the country’s robust economic growth over the past three decades, China has become dependent on the heavy use of coal and must now make efforts to develop legislation and technologies in order to cap and cut coal consumption, through which a more sustainable growth path can be achieved.

The pursuit of low-carbon growth can allow China to continue on the path to becoming a high-income country while allowing it to address its severe air pollution issue. Recent data from the government revealed that 90% of 360 cities in China do not meet national air quality standards for fine particulate matter, which can have severe health consequences due to its ability to enter the bloodstream and penetrate deep into lungs.⁵⁰⁰ 40% of those cities have particulate matter levels that are twice as high as the national standard. Thus, China currently faces an imperative to take steps to solve this acute problem.

According to *China and the New Climate Economy*, a study conducted by Tsinghua University in 2014, China can maintain a sustainable economic growth of 7% to 8% in the short run and 5% by 2030, secure pollution reduction, and achieve energy security at the same time.⁵⁰¹ The study finds reducing coal consumption and limiting GHGs through energy efficiency can promote improvements in technological innovations and productivity.⁵⁰² Such improvements can help China avoid the middle-income trap, as growth from investment declines and resources become scarcer in coming years.⁵⁰³

⁴⁹⁹ ROBERT LAWRENCE KUHN, HOW CHINA’S LEADERS THINK: THE INSIDE STORY OF CHINA’S PAST, CURRENT, AND FUTURE LEADERS 152-160 (2011).

⁵⁰⁰ Edward Wong, *Hundreds of Chinese Cities Don’t Meet Air Standards, Report Finds*, N.Y. TIMES, Apr. 21, 2015, available at <http://www.nytimes.com/2015/04/22/world/asia/hundreds-of-chinese-cities-dont-meet-air-standards-report-finds.html>.

⁵⁰¹ Yamin Wang and Tan Copsey, *China Can Reduce Carbon and Air Pollution without Harming Economy, Study Finds*, THE NEW CLIMATE ECONOMY, Nov. 14, 2014, available at <http://newclimateeconomy.net/content/release-china-can-reduce-carbon-and-air-pollution-without-harming-economy-study-finds>.

⁵⁰² *Id.*

⁵⁰³ *Id.* The middle-income trap is an economic concept used to describe “the phenomenon of hitherto rapidly growing economies stagnating at middle-income levels and failing to graduate into the ranks of

Furthermore, efforts to switch away from dirty fossil fuels like coal will promote the development of renewable energy and cleaner non-renewable energy. China is making an effort to switch to cleaner energy resources by investing USD \$56.3 billion in renewable energies such as wind and solar, representing 61% of total investment by developing economies, and exceeding the total investment by Europe as a whole in 2013.⁵⁰⁴ Such progress will reduce air pollution due to coal combustion and bring improvements in air quality and human health, in addition to reducing GHG emissions. China's success with developing a renewable energy industry at amazing speed also illustrates China's great potential in moving forward environmental initiatives through systematic industrial and financial measures after the central and local governments sets clear policy priorities.

China now faces the challenges of climate change and pollution after focusing on economic growth at the cost of the environment over the past three decades. China has enacted legislation to address climate change issues in order to meet its commitment of a 40% to 50% carbon emissions reduction per unit of GDP by 2020. Even though the government faces reluctance from many stakeholders in terms of enforcement and compliance, it is making efforts to build effective MRV to ensure that targets are achieved. Reductions in GHG emissions will help China not only cope with climate change, but also drive the country towards a more sustainable model of development that will ensure long-term growth.

high-income countries.” Shekhar Aiyar et al., *Growth Slowdowns and the Middle-Income Trap*, IMF WORKING PAPER 1 (March 2013) available at <http://www.imf.org/external/pubs/ft/wp/2013/wp1371.pdf>.

⁵⁰⁴ Jack Perkowski, *China Leads In Renewable Investment -- Again!*, FORBES, Jun. 17, 2014, available at <http://www.forbes.com/sites/jackperkowski/2014/06/17/china-leads-in-renewable-investment-again/>.

B. KEY OVERALL RECOMMENDATIONS FOR CHINESE POLICYMAKERS

Based on the key takeaways identified above in each of the individual case studies and the accompanying analysis of the U.S. experience with climate change legislation and regulations, the following key recommendations might be applied to the development of China's climate change law:

- 1) **A robust stakeholder engagement process can facilitate buy-in from both industry groups and civil society and lead to more effective enforcement once a law and regulation is passed.** RGGI in particular has been noted for its successful stakeholder engagement, and industry representatives felt that their input was seriously considered in the development of the program. Under the leadership of Administrator Gina McCarthy, who coordinated Connecticut's involvement with RGGI, EPA has tried to emulate this approach with the Clean Power Plan. Given the difficulties China may face with enforcing environmental laws, Chinese officials would need to use the stakeholder process to have a dialogue with industry leaders about what the government can do to incentivize compliance.
- 2) **Different regions of large countries like the United States and China often require different approaches to address climate change.** As the effects of climate change vary greatly from one region to the next, national and state policy makers should allow for local leaders to design policies best suited to address the challenges unique to their locality. The CPP demonstrates that different areas can feasibly meet vastly different standards based on their level of development and/or current energy mix. Although a cap-and-trade system works best with a national approach, policymakers should keep regional differences in mind if they pursue parallel regulatory systems. Having individualized climate targets set by the national government may also help to overcome enforcement issues at the local level. The CPP's approaches to penalizing states that do not meet set targets could be adapted for the Chinese context to this end.
- 3) **Developing synergies between climate regulations and existing regulation is important for reducing the burden on industry and facilitating their compliance.** Massachusetts's integration of both climate change mitigation and adaptation policies into MEPA, the state system for environmental impact assessments, is an example of this approach. China could take a similar approach with its Environmental Impact Assessment Law. The designers of RGGI also ensured that required reporting under the program built on what was already being reported to EPA under air pollution regulations. Thus, for a number of power plants, reporting for RGGI was "as simple as adding another column to the spreadsheet."⁵⁰⁵
- 4) **The design of a cap-and-trade program is critical for its success and for ensuring that the program does not negatively affect economic growth.**
 - a) *Reinvestment in energy efficiency.* In particular, ensuring that reinvestment in energy efficiency is a component of the system can facilitate economic development

⁵⁰⁵ Interview with Bill Lamkin, Environmental Engineer, Massachusetts Department of Environmental Protection, in Cambridge, Mass. (Apr. 1, 2015).

under cap-and-trade. Energy efficiency programs bring huge savings to businesses and consumers, allowing them to increase their global competitiveness.⁵⁰⁶

b) Predictability of prices for market stability. Another important issue to consider when designing a cap-and-trade system is the predictability of prices for market stability. California has a minimum reserve price for allowances, which also takes in to account annual inflation rate, below which they cannot be auctioned. This acts as a long-term carbon price signal for companies and market players. It is also important to create an allowance reserve, which acts as a buffer in the event of price and supply volatility. This buffer, which needs to be regularly replenished, should provide allowances in case of low supply or buy them in case of oversupply, in order to maintain a price range which can keep investors active in the market.

c) Encourage complementary policies. Finally, it is important to avoid the implementation of policies that are conflicting rather than complementary in nature. It is particularly important to study the possible interactions of the different policies that are implemented simultaneously for GHG emission reduction. For the cap-and-trade system to be successful, there should be a stable demand and supply of allowances. If more than one emission reduction target is imposed on same set of companies or industrial units (through a set of policies like RPS and emission caps), then it might suppress the demand for allowances in the cap-and-trade system, or may create an oversupply of allowances, thus, creating a risk of market failure.

5) GHG monitoring, evaluation, and verification form the foundation of any successful climate change policy. The data obtained through monitoring, evaluation and verification of GHG emissions from power plants and other industries set a baseline for targeted policies, and continual monitoring enables the government to assess which policies are most successful in meeting reduction goals. Furthermore, public disclosure of this information can itself serve as a regulatory tool. Companies and localities that are committed to being “green” can set internal reduction goals beyond what is required (or able to be enforced) by the government. Given the enormity of monitoring and verifying emissions data from the entire economy, there are substantial benefits to allowing nongovernmental actors to assist in the endeavor. The Chinese government could facilitate the establishment of an organization similar to The Climate Registry that is directed by member states or it could encourage international organizations with substantial expertise, such as the Carbon Disclosure Project, to operate in China.

Although the challenges China and the United States face in addressing climate change are different, the goals of the two countries are ultimately the same—to take action without sacrificing economic growth and global competitiveness. The U.S. experience thus far has shown that reaching this goal is possible. It has also shown that the *design* of the regulatory systems needed to reach this goal is critically important. The purpose of this paper is to

⁵⁰⁶ For example, Maine (one of the RGGI states) has a grant program for the installation of CHP systems. There are cases where businesses were able to take advantage of this program and cut costs to the point of becoming a globally competitive company. *Id.*

share lessons learned by the U.S. with Chinese policymakers in the hopes that these lessons may be helpful to Chinese policymakers in their efforts to address climate change through legislation and regulation in China.

APPENDIX A: PORTFOLIO OF KEY STRATEGIES UNDER MGWSA

Buildings, Energy Efficiency, and Demand Side Management⁵⁰⁷
All Cost Effective Energy Efficiency
<ul style="list-style-type: none"> investor-owned natural gas and electric utilities in Massachusetts are required to acquire all cost-effective energy efficiency, i.e., energy efficiency which is less costly than securing additional energy supply
<ul style="list-style-type: none"> highest goal for GHG reductions of all strategies in the 2020 Plan, at 7.1% below 1990 levels.
<ul style="list-style-type: none"> Net savings of \$4 billion on \$1.5 billion investments in natural gas and electric efficiency under first Three-Year Plan (2009-2012); second Three-Year Plan (2013-2015) estimates net savings of over \$6 billion
Advanced Building Energy Codes
<ul style="list-style-type: none"> Requires building energy codes meet or exceed the International Energy Conservation Code (“IECC”)
<ul style="list-style-type: none"> Sharp decline in residential construction during recession limited penetration of advanced codes
<ul style="list-style-type: none"> Has not delivered the expected GHG emissions reduction
Tree Retention and Planting to Reduce Heating and Cooling Loads
<ul style="list-style-type: none"> Expected to produce GHG reductions of 0.1 MMTCO_{2e} by 2020
<ul style="list-style-type: none"> Over 20,000 trees planted, replanting of 1,100 trees in Springfield
<ul style="list-style-type: none"> Beginning in 2014, 15,000 additional trees
Energy Generation and Distribution
Clean Energy Imports
<ul style="list-style-type: none"> 5.3% of reduction expected by 2020
<ul style="list-style-type: none"> New England states passed a resolution in 2012 supporting regional procurement of clean energy from Canada
<ul style="list-style-type: none"> Looking to a variety of large-scale clean energy resources including large-scale wind energy and large hydro-electric
Expanded RPS and APS
<ul style="list-style-type: none"> RPS: require that 15% of electricity supply by 2020, and an additional 1% every year thereafter, must be produced from new renewable generation resources including solar, wind, small hydro-electric, biomass, and anaerobic digestion
<ul style="list-style-type: none"> APS: at least 5% of Massachusetts’ electric demand must be met with high-efficiency alternative energy sources, such as CHP and flywheel storage, by 2020.
<ul style="list-style-type: none"> Estimated that GHG reductions of 1.1 MMTCO_{2e} by 2020/1.2% below 1990 levels
<ul style="list-style-type: none"> RPS looks positioned to meet or even exceed the 2020 goals
<ul style="list-style-type: none"> Installation of new solar energy projects hugely successful

⁵⁰⁷ See MGWSA 5-YEAR PROGRESS REPORT, *supra* note 162, at 32-33, 39, 49-50, 58, 62.

More Stringent EPA Power Plant Rules
<ul style="list-style-type: none"> • Lead to closure of 2 coal-fired power plants • Met estimates from the 2020 plan • Another plant have announced a plan to close in 2017
Transportation, Smart Growth, and Land Use
Federal and California Vehicle Efficiency and GHG Standard
<ul style="list-style-type: none"> • Expect GHG reductions of 2.4 MMTCO_{2e} by 2020 • Progress on these strategies is still being calculated but is expected to be relatively strong, given the availability of many new higher mileage vehicle options across many vehicle classes.
Federal Fuel Efficiency Standards for Medium and Heavy Duty Vehicles
<ul style="list-style-type: none"> • GHG reductions of 0.3 MMTCO_{2e} expected by 2020 • Appear to be on track to delivering the anticipated GHG reductions
Clean Car Consumer Incentives
<ul style="list-style-type: none"> • Expected to result in GHG reductions of 0.2 to 0.4 MMTCO_{2e} • Grants to municipalities purchase electric vehicles (“EVs”) and build fast-charging stations • Only started in 2013
Green Dot
<ul style="list-style-type: none"> • Estimated GHG reductions of 1.2% • Promoting the healthy transportation modes of walking, bicycling, and public transit; and supporting smart growth development - make it easier for households and businesses to decrease the number and distance of vehicle trips, reducing vehicle miles traveled (“VMT”) and related emissions. • Developing metrics and indicator for tracking progress
Pay As You Drive (“PAYD”) auto insurance (pilot program)
<ul style="list-style-type: none"> • Slow progress because of legal challenges • Unlikely to result in the estimated reduction in 2020
Non-Energy Emissions
Stationary Equipment Refrigerant Management
<ul style="list-style-type: none"> • 1.3% of 1990 emissions expected • Draft regulations in progress for leak detection and repair in facilities with large refrigeration units; transitioning to refrigerants with lower global warming potential
Reducing Emission from Plastics
<ul style="list-style-type: none"> • Goal of reducing solid waste disposal by 30% by 2020 • Actions to reduce plastics combustion detailed
Reducing SF ₆ Emissions from Gas-Insulated Switchgear
<ul style="list-style-type: none"> • In 2013, proposed draft regulations being finalized • Require owners of gas-insulated switchgear to reduce leakage rates of existing equipment
Cross-Cutting Policies
Leading by Example
<ul style="list-style-type: none"> • Reduce emissions at all executive branch agencies

Green Communities
<ul style="list-style-type: none"> • Encourage and guide municipalities to designated locations for renewable/alternative energy generation
<ul style="list-style-type: none"> • Purchase only fuel-efficient vehicles for municipal use
<ul style="list-style-type: none"> • Establish a municipal energy use baseline and develop a plan to reduce energy use by 20% within five years - equal to over 173,000 tons CO₂e, or the equivalent of taking nearly 31,000 cars off the road
<ul style="list-style-type: none"> • 123 municipalities have been designated Green Communities
MEPA GHG Policy and Protocol
<ul style="list-style-type: none"> • Requires project proponents to undertake an analysis of a project's primary sources of GHG emissions at an early stage of project planning, and examine all feasible alternatives that may have lower GHG emissions potential.

APPENDIX B: MEASURES LAID OUT IN CALIFORNIA'S INITIAL SCOPING PLAN UNDER AB 32

Sector ⁵⁰⁸	Measures	
Transportation	Advanced Clean Cars	
	Low Carbon Fuel Standard	
	Regional Transportation-Related GHG Targets	
	Vehicle Efficiency Measures 1. Tire Pressure 2. Fuel Efficiency Tire Program 3. Low Friction Oil 4. Solar Reflective Automotive Paint and Window Glazing	
	Ship Electrification at Ports (Shore Power)	
	Goods Movement Efficiency Measures 1. Port Drayage Trucks 2. Transportation Refrigeration Units Cold Storage Prohibition 3. Cargo Handling Equipment, Anti-Idling, Hybrid, Electrification 4. Goods Movement System-wide Efficiency Improvements 5. Commercial Harbor Craft Maintenance and Design Efficiency 6. Clean Ships 7. Vessel Speed Reduction	
	Heavy-Duty Vehicle GHG Emission Reduction	
	Medium- and Heavy-Duty Vehicle Hybridization Voucher Incentive Project	
	High-Speed Rail	
	Electricity and Natural Gas	Building Energy Efficiency – Electricity
		Appliance Energy Efficiency Standards - Electricity
Utility Energy Efficiency Programs - Electricity		
Building Energy Efficiency – Natural Gas		
Appliance Energy Efficiency – Natural Gas		
Utility Energy Efficiency Programs – Natural Gas		
Solar Water Heating (CSI Thermal Program)		
Combined Heat and Power		
33% Renewable Portfolio Standard		
Senate Bill 1 Million Solar Roofs (California Solar Initiative, New Solar Home Partnership, Public Utility Programs) and earlier solar programs		
Water	Water Use Efficiency	
	Water Recycling	
	Water System Energy Efficiency	
	Reuse Urban Runoff	

⁵⁰⁸ CARB, APPENDIX B - STATUS OF INITIAL SCOPING PLAN MEASURES (2014), available at http://www.arb.ca.gov/cc/scopingplan/2013_update/appendix_b.pdf.

	Renewable Energy Production
	Water Public Goods Charge
Green Buildings	State Green Building Initiative: Leading the Way with State Buildings (Greening New and Existing State Buildings)
	Green Building Standards Code (Greening New Public Schools, Residential and Commercial Buildings)
	Beyond Code: Voluntary Programs at the Local Level (Greening New Public Schools, Residential and Commercial Buildings)
	Greening Existing Buildings (Greening Existing Homes and Commercial Buildings)
Industry	Energy Efficiency and Co-Benefits Audits for Large Industrial Sources
	Oil and Gas Extraction GHG Emission Reduction
	GHG Emissions Reduction from Natural Gas Transmission and Distribution
	Refinery Flare Recovery Process Improvements
	Work with the local air districts to evaluate amendments to their existing leak detection and repair rules for industrial facilities to include methane leaks
Recycling and Waste Management	Landfill Methane Control Measure
	Increasing the Efficiency of Landfill Methane Capture
	Mandatory Commercial Recycling
	Increase Production and Markets for Compost and Other Organics
	Anaerobic/Aerobic Digestion
	Extended Producer Responsibility (EPR)
	Environmentally Preferable Purchasing (EPP)
Forest	Sustainable Forest Target
High Global Warming Potential Gases⁵⁰⁹	Motor Vehicle Air-Conditioning Systems: Reduction of Refrigerant Emissions from Non-Professional Servicing
	SF ₆ Limits in Non-Utility and Non-Semiconductor Applications
	Reduction of Perfluorocarbons in Semiconductor Manufacturing
	Limit Use of Compounds with High Global Warming Potentials in Consumer Products
	Low Global Warming Potential Refrigerants for New Motor Vehicle Air-Conditioning Systems
	Stationary Equipment Refrigerant Management Program-Refrigerant Tracking/Reporting/Repair Program; Stationary Equipment Refrigerant Management Program-Specifications for Commercial and Industrial Refrigeration; SF ₆ Leak Reduction Gas Insulated Switchgear
	Mitigation Fee on High-GWP Gases
Agriculture	Methane Capture at Large Dairies Utilizing Anaerobic Digestion

⁵⁰⁹ In this sector, CARB also approved a number of measures that were determined to be not feasible at the time of the First Update.

APPENDIX C: SUGGESTED ADAPTATION MITIGATION MEASURES IN THE MEPA DRAFT ADAPTATION POLICY

Coastal Projects

- Provide additional freeboard (i.e., elevate the lowest structural member of the building above the Base Floor Elevation (BFE)) above the minimum applicable code requirements. This should be considered for all structures undergoing improvements or repairs, not just new construction.
- Consider applying V-Zone requirements to projects in the Coastal A Zone and the entire Special Flood Hazard Area identified by the National Flood Insurance Program (NFIP).
- Construct structures to withstand direct and indirect impacts of high winds (if not already required by code) through the improved design, use of wind-resistant materials and connections (i.e., clips and braces), and use of impact resistant materials, windows and shutters.
- Implement measures to effectively wet floodproof the structure.
- Implement measures to effectively dry floodproof a structure to seal a structure from floodwater intrusion (not appropriate for anything below BFE in V and Coastal A Zones).
- Design and construct or rebuild roads and bridges at higher elevations to incorporate future sea-level rise (where practical).
- Locate utility connections above projected flood elevations.
- Design wastewater systems (septic or closed pipe) to accommodate projected sea-level rise and/or associated elevations of groundwater. Or, at a minimum, evaluate how the location and elevation of these facilities will need to be modified in the future to respond to climate change impacts.
- Provide alternative means of egress located landward of the proposed structure.
- Create wetlands or off-channel drainage storage basins to reduce erosion during high- flow periods.
- Plan and allow for inland migration of wetland resource areas through preservation of adjacent low gradient slopes.
- Reduce impacts within hazard prone areas through demolition or relocation of existing structures or avoidance and/or limitation of new development.
- In coastal and estuarine or tidally influenced creeks, streams and rivers, consider constructing or enhancing a “living shoreline” to mitigate coastal erosion and preserve natural habitat.
- Establish shoreline setbacks and buffer zones and locate structures as far away from flood and erosion prone areas as practicable. Consider historic and future erosion rates when establishing a setback area.
- Establish conservation restrictions or other development limitations in hazard prone areas.
- Facilitate and implement ecosystem restoration, creation or enhancement projects designed to withstand the impacts of climate change.

- Elevate land through dune restoration, enhancement and management, and beach nourishment.
- Elevate land by filling in upland areas outside of a floodplain.
- Maintain existing shoreline armoring structures such as breakwaters, groins, seawalls, bulkheads, revetments, dikes, and storm surge barriers. In some cases, structures may be an alternative subject to local, State and Federal regulations. Such structures should be designed and constructed to minimize adverse impacts at the site of the structure, the adjacent properties and infrastructure, and the broader coastal system and allow for modifications in response to projected climate change impacts. Avoid fill, landscaping walls, and curbing that interferes with the free passage of coastal flood waters beneath buildings or causes changes in flow direction during coastal storms that could result in damage to buildings or infrastructure.
- Incorporate low impact design (LID) stormwater Best Management Practices (BMPs) into project design to the maximum extent practicable to promote stormwater capture, infiltration, and reuse.
- Use diverse types of drought-tolerant, native plant varieties in landscaping.
- Actively remove invasive species to enhance habitat for key native species.
- Connect landscapes with corridors to facilitate wildlife migration and overall habitat biodiversity.
- Design new or rebuild existing drainage systems with larger pipes or provide reserve areas to expand retention, detention and/or infiltration areas in response to sea-level rise or increased storm intensity.
- Design drainage outlet pipe elevations in response to projected sea-level rise or increased storm intensity, or, at a minimum, evaluate how these elevations will be modified in the future to respond to climate change impacts.
- Maximize on-site stormwater infiltration to reduce flow and capacity burden on closed pipe drainage systems.
- Manage overland runoff to avoid increasing erosion of coastal landforms.
- Use bridges or wetland spans in lieu of culverts to accommodate higher stormwater runoff volumes.

Development Within and Adjacent to Floodplains, Riverfront or Areas Affected by Droughts

- Provide additional freeboard (i.e., elevate the lowest structural member of the building above the Base Floor Elevation (BFE)) above the minimum applicable code requirements. This should be considered for all structures undergoing improvements or repairs, not just new construction.
- Implement measures to effectively wet floodproof the structure
- Implement measures to effectively dry floodproof a structure to seal a structure from floodwater intrusion.
- Design wastewater systems (septic or closed pipe) to accommodate projected flood levels and/or associated groundwater elevations. Or, at a minimum, evaluate how the location and elevation of these facilities will need to be modified in the future to respond to climate change impacts.

- Maximize on-site stormwater infiltration to reduce flow and capacity burden on closed pipe drainage systems.
- Provide alternative means of egress for use during flooded conditions.
- Identify access and egress points (vehicular and pedestrian) in relation to elevations and floodplains.
- Manage overland runoff to avoid erosion of wetland resource areas.
- Consider backflow preventers for wastewater and stormwater.
- Install watertight utility conduits.
- Locate utility connections above projected flood elevations.
- Design and construct or rebuild roads and bridges at higher elevations to incorporate future inland flooding elevations (where practical).
- Use bridges or wetland spans in lieu of culverts to accommodate higher stormwater runoff volumes and enhance habitat.
- Plan and allow for migration of floodplains and wetland resource areas through preservation of adjacent low gradient slopes.
- Reduce impacts within hazard prone areas through demolition or relocation of existing structures or avoidance and/or limitation of new development.
- Elevate land by filling in upland areas outside of a floodplain.
- Avoid fill, landscaping walls, and curbing that interferes with the free passage of floodwaters beneath buildings or could result in damage to buildings or infrastructure.
- Incorporate low impact design (LID) stormwater Best Management Practices (BMPs) into project design to the maximum extent practicable to promote stormwater capture, infiltration, and reuse.
- Design new or rebuild existing drainage systems with larger pipes or provide reserve areas to expand retention, detention and/or infiltration areas in response to increased storm intensity.
- Design drainage outlet pipe elevations in response to increased flooding or storm intensity, or, at a minimum, evaluate how these elevations will be modified in the future to respond to climate change impacts.
- Adopt water conservation and reuse measures on-site.
- Use diverse types of drought-tolerant, native plant varieties in landscaping.
- Actively remove invasive species to enhance habitat for key native species.
- Connect landscapes with corridors to facilitate wildlife migration and overall habitat biodiversity
- Establish conservation restrictions or other development limitations in hazard prone areas.
- Facilitate and implement ecosystem restoration, creation or enhancement projects designed to withstand the impacts of climate change.
- Projects Affected by Increases in Temperature and Frequency of High Heat Days (90 degrees or more)
- Limit clearing of the site; maintain existing vegetative cover to the maximum extent practicable.
- Re-vegetate site and incorporate tree planting and/or Complete Streets design elements.

- Reduce impervious areas by minimizing building footprints, paved areas, etc.
- Minimize energy use through proper building orientation and use of appropriate landscaping (e.g. trees for shading parking lots or southern facing facades)
- Use high-albedo paving surfaces where paving is necessary.
- Provide shade for parking lots through the incorporation of trees or canopies.
- Improve building envelope through higher R-value insulation in walls, roof, and if appropriate, basement walls and ceilings.
- Maximize the thermal mass of walls, roofs and floor to provide thermal damping
- Install lower U-value windows to improve envelope performance and incorporate window glazing to balance and optimize daylighting, heat loss and solar heat gain performance.
- Construct green roofs to reduce heat load on roof, further insulate, and retain/filter rainwater.
- Evaluate use of high-albedo roofing materials to reduce heat absorption

Miscellaneous

- Construct structures to withstand direct and indirect impacts of high winds (if not already required by code) through the improved design, use of wind-resistant materials and connections (i.e., clips and braces), and use of impact resistant materials, windows and shutters.
- Increase energy resiliency through incorporation of appropriate on-site renewable energy systems into project including solar PV (both first and third-party ownership models should be evaluated), solar thermal, wind, low-impact hydro, geothermal, biomass (including pellets), and bio-gas strategies.
- Increase energy resiliency through incorporation of combined heat and power (CHP) technologies where sufficient year-round thermal demand exists.
- Consider black start CHP and ability to island.
- Incorporate climate change resiliency measures into tenant lease agreements for tenants who choose fit-out materials.
- Incorporate operable windows, emergency generators for water/wastewater pumps (in high-rise buildings), and other measures to allow safe operations of facilities during extended periods of power and or heating/cooling loss.
- Establish plans for alternative parking locations for tenant vehicles in structured or surface parking areas subject to flooding during extreme events.