China's Climate Governance with Focus on Pilot Programs

By

Shiyuan Jing

A dissertation submitted in partial satisfaction of the

requirements for the degree of

Doctor of the

Science of Law

of the

University of California, Berkeley

Committee in charge:

Professor Daniel Farber, Chair
Professor Laurent Mayali
Professor Daniel Kammen

Fall 2019

Abstract

China’s Climate Governance with Focus on Pilot Programs

by

Shiyuan Jing

Doctor of the Science of Law

University of California, Berkeley

Professor Daniel Farber, Chair

The idea of evaluating government program is a relatively new and ticklish idea to China's government and public policymakers. In the meantime, many environmental policy pilots are being carried out as important components of China's market-oriented reforms and climate policy package. These changes require us to rethink China's current process of creating environmental policy, as it seems to affect policy variation temporarily. This article argues that most of China's recent environmental campaign programs and policy innovations have embraced strict environmental enforcements, audits, and inspections, without a carefully designed environmental program evaluation system. It demonstrates that most of China's environmental program evaluation approaches are results-oriented, and most are internal evaluations; that evaluations are imposed mainly on project owners and lower-level government agencies through top-down governance-, rather than actually assessing agency performance and government accountability. It explains patterns in China's recent policies that might point to room for change.

CONTENTS

Page
The Introductory Chapter----------1
I. Introduction----------1
II. Background----------4
A. Policy choices for China----------4
B. Program evaluation----------6
C. Pilot programs definition and selected cases----------8

Chapter 1 Energy, Electricity and the State----------11
I. Part One: China's energy system and carbon emissions – The stage where China is and its current energy mix----------12
A. Energy use and carbon emissions by economic sector----------12
B. Electricity----------14
C. China's electricity sources and current energy production mix----------19
II. Part Two: Climate and Energy Governance - Where Law Intersects with Science, Economic, and Politics----------25
A. Energy security----------25
B. Economic – economic planning agency vs. environment regulatory agency----------27
C. State and local – the vertical dimension of China's climate governance-----28
D. Politics----------32
III. Part Three: General government structure - key authorities over climate and energy issues, former state-owned power producers, and institutes----------33
A. General climate governance agencies----------33
B. Energy regulatory agencies----------39
C. Other government organized bodies----------40
D. Third-party evaluation agencies----------41
IV. Part Four: Will a hybrid climate and energy governance model always be necessary? – The horizontal dimension of China's climate and energy governance----------42
V. Conclusion----------44

Chapter 2 Evaluating Environmental Programs in Theory----------45
I. Part One: Program evaluation and environmental policy----------45
A. Impact evaluation – evaluations that focus on environmental impacts------46
B. Formative evaluation – evaluations that focus on acquiring information that assists with (early) program improvements----------47
C. Process evaluation/implementation evaluation – evaluations that focus on program implementation----------48
D. Efficiency evaluation/economic evaluation – evaluations that focus on program benefits and costs----------49

II. Part Two: The logic, purposes and motivations----------51
III. Part Three: The constraints and limits – obstacles and pragmatic issues: politics, knowledge, and policy change----------54
IV. Part Four: Environmental program evaluation in practice----------58

Chapter 3 Observations on the California Climate Bill AB 32 and selected cases of China's carbon trading program----------61
I. Part One: Lessons learned from China's carbo trading pilots----------61
A. Chinese experience with carbon emissions trading----------61
B. Case study: the relatively successful Shenzhen Carbon Trading Pilot---------71
II. Part Two: Observations on the California Climate Bill – Assembly Bill 32 (AB 32)----------75
A. California AB 32 and its evaluation programs----------75
B. Why does China need to seek environmental program evaluation? ----------77
III. Part Three: Some other implications from a comparative and transnational perspective----------79
A. Creating connectivity----------79
B. Distinguishing Chinese characteristics and non-Chinese characteristics-----80
IV. Conclusion----------83

Chapter 4 The Role of Program Evaluation in China's Environmental Policy and Program within Government----------85
I. Part One: Clarifying the Concept of Environmental Program Evaluation----------86
A. Understanding the role of program evaluation in program and policy processes----------86
B. Distinguishing environmental program evaluation from environmental auditing and environmental inspection (all in the summative stage) --------90
II. Part Two: Identifying China's environmental program evaluation approaches, key authorities and entities----------95
A. Identifying China's environmental program evaluation approaches, patterns and effectiveness----------96
B. Identifying China's environmental program departments within governments and third-party evaluation bodies----------105
III. Part Three: Recent policy trends, limitations, and opportunities for learning--109
A. A fundamental shift from focusing on up-front examinations and approvals to registration, archival filing, regional filing, regional joint evaluation, and notification-commitment----------110
B. Succession of strong policy support making clear that environmental enforcement is here to stay as a government priority----------111
C. Heavier roles of program evaluation on a par with governmental supervision in the field of climate governance----------112

Chapter 5 Toward a more vigorous and richly diverse environmental program evaluation system----------114

ACKNOWLEDGMENTS:

This dissertation is dedicated to my beautiful daughters Mikayla and Layla,

to my husband Ryan, my advisor Professor Farber,

to my families, the University of California, Berkeley,

and to Blue Willow Teaspot.

Hillary

The Introductory Chapter

I. Introduction

When the National Development and Reform Commission (NDRC), the leading ministry in charge of climate policy in China, determined that a national carbon trading program would contribute importantly to achieving China's emissions reduction target in addition to the traditional command-and-control regulations, it took the bold step of launching a more market-based instrument – the national emissions trading scheme (ETS) – which has been tested through seven pilot programs in different parts of China.

As a national cap-and-trade program involving six of its largest carbon-emitting industrial sectors, the national ETS has required governments to locate the major sources of emissions[1], measure their output and issue allowances that amount to a right to pollute a certain amount of greenhouse gas (GHG). Companies that innovate and reduce their emissions below the government cap can sell their excess allowances to companies that do not.[2] Furthermore, despite the questions regarding the necessity and feasibility of implementing a national ETS in China so soon, the leadership determined that market-based instruments should be more economically efficient based on theoretical analysis and research, and lessons learned from the traditional command–and–control regulations.[3] The NDRC, thus, wished to start the world's largest carbon trading market as part of its market-oriented reforms and climate policy package.

As the specific local government agencies began this task in 2013, there were many unknowns about what the challenges would be in policy design and implementing pilot carbon trading programs across a set of widely diverse regions. In general the NDRC found the programs to be productive, to represent substantial quality and applicability for the overall design of the national ETS, and to be efficient in motivating industries to reduce carbon emissions in a cost-effective way. However, when the seven experiment programs were examined together, some common needs emerged that would benefit future evaluations and implementations of environment programs and climate policy as a whole. Most of the enforcing agencies noted the lack of adequate surveillance data on energy consumption, GHG emission, and pollutants emerging from the related facilities and made recommendations to bolster surveillance systems. An increased focus on policy design and law-making was another recurring theme, as was the need to strengthen efforts to move theory to practice in order to stimulate market liquidity and trading activities. Improvements in integrating different enforcing agencies that leads to less political gridlock were also recommended.

ETS is not the only strategy used by China, striving to develop a low-carbon economy in a cost-effective manner. In recent years, feed-in tariffs (FITs) on

---

[1] Beginning with coal-fired power generation

[2] Jing Cao Mun Ho Govinda R. Timilsina. (2016). *Impacts of Carbon Pricing in Reducing the Carbon Intensity of China's GDP*. The World Bank.

[3] Shen, Y. (2015). Crossing the River by Groping for Stones: China's Pilot Emissions Trading Schemes and the Challenges for a National Scheme. Retrieved from https://papers.ssrn.com/abstract=2711788.

renewable energy (in particular wind and solar power) electricity prices, accompanied by tax abatement policies and subsidies on the production of renewable energy equipment, have been a dominant factor in the rapid development of renewable energy in China. They are designed to accelerate investment in renewable energy technologies by offering long-term contract payments to ordinary energy users for the renewable electricity they generate. Rather than pay an equal amount for energy, different kinds of renewable energy sources have different benchmarking FIT prices, reflecting different costs and providing price certainty that help finance renewable energy investments.[4] FIT and ETS will constitute a major climate policy package in the future in China, aiming to limit the use of the traditional command-and-control policies.[5]

The introduction of FIT instruments for renewable energy as a major support policy has accelerated the deployment of renewable energy in China. However, this increase in renewable energy development was not taken into account in the design of the national electricity power system. Since China issued the FIT scheme for wind projects in 2009, pushing wind turbine installation to overtake that in the United States, the nation's grid infrastructure was not ready to cope with such a big jump in capacity. As a result, many newly installed wind turbines remain disconnected from the grid, with connected turbines forced to be shut down during peak winds, causing lots of wind-generated electricity to be unused.[6]

To avoid the same waste happening to other installed generating capacity and increase the share of renewable – and distributed – energy generation in its power supply, in 2015, China started a new chapter in its electricity system reform, which aims to introduce market mechanisms across the power sector. This new round of electricity market reform covers the electricity trade center, retail market reform, dispatch plan, transmission and distribution (T&D) tariff reform, electricity pricing reform and several other key areas in its electric power industry.[7] China has discussed introducing market-driven power prices for years. The opening up of the retail electricity market and the relatively independent joint-stock electricity trade center is the highlight of this reform, allowing the market to determine energy prices and diversify suppliers under the reforms.

As part of the reform package, 18 integrated pilot reforms and 8 retail market reforms were approved by the NDRC before the end of 2016 across different regions, and over 20 trial plans have been submitted by the local agencies. It is hoped that the experiences collected from the pilot reforms programs can be applied to the rest of China. China will also strengthen governmental supervision and electric power planning to ensure the system operates at its highest efficiency and produces reliable supply.[8]

---

[4] Couture, T., & Gagnon, Y. (2010). An analysis of feed-in tariff remuneration models: Implications for renewable energy investment. *Energy Policy*, *38*(2), 955–965.

[5] Lin, W., Gu, A., Wang, X., & Liu, B. (2016). Aligning emissions trading and feed-in tariffs in China. Climate Policy, 16(4), 434–455.

[6] Liu, C. (2011). China uses feed-in tariff to build domestic solar market. The New York Times, 14.

[7] Liu, X., Kong, L., & Others. (2016). A New Chapter in China's Electricity Market Reform. National University of Singapore Energy Studies Institute Policy Brief, March, 21.

[8] China Issues Rules to Reform Electricity System, NE21.Com Says. (2015, March 23). Bloomberg News. Retrieved

For now, among the basic industrial sectors in China, the power sector is the only one with fully regulated prices. Therefore, this policy shift, aiming to liberalize its electricity sector, has shown unparalleled determination and renewed interest of China's new leadership – that is, letting the market play a greater role in the economy as well as in allocating resources instead of the traditional command-and-control regulations.

Against this background, another brand-new market-based approach – the energy use trading program – will soon begin to emerge and develop in China. As stated by the NDRC, four pilot programs will first implement the trail trading and China plans to gradually expand the trading program to other areas depending on a review of the results in 2020. Under this program, companies are encouraged to install renewable energy generators, as self-used renewable energy will not be counted in their energy consumption. However, questions remain as to the possible overlap of this program and the ETS.

The NDRC, as well as other related government agencies in China have a large task – conducting research, pilot programs and making climate policy to improve China's air quality and "cap" energy consumption – but with limited resources. At the same time, these different approaches of climate governance – each sharing basic contours but diverging on the details – are all left with the NDRC and other unspecified decisionmakers in the position to choose which model to follow in answering the perennial questions about who decides what in which context. This question proves more difficult than at first it may seem, especially with no clear rule or unified standard of how people should choose among them. What is the standard for a good project? How do the "central planners" value things and define which model makes sense? What factor will be or are being taken into account in the design process? Given areas of unequal demographic trends, economic development and growth, how do they define the economical and financial influence of each project and how do they define what is the best way? Should cost-benefit analysis be taken into account in the program evaluation process?

China's top economic-planning agency, the NDRC, does not have the same experience of actually running a market as their traditional market designing and policy planning practice. At this point, all of these new pilot programs must be implemented in the real world outside Beijing. The field consists of complex social, political, fiscal, market, legal, intergovernmental, bureaucratic, and institutional conditions that even the most seasoned central policymakers cannot fully anticipate and have relatively little control over.[9] A subtly designed evaluation system as well as strong regulatory capacity, in particular the monitoring capacity, are much needed to ensure the smooth operation of all these environmental programs. Moreover, the program evaluation framework itself, once established, will need a strong implementation mechanism.

These are the challenges of China's climate governance. It is in this light that I am

---

from https://www.bloomberg.com/news/articles/2015-03-23/china-issues-rules-to-reform-electricity-system-ne21-com-says.

[9] Schuck, P. H. (2014). *Why Government Fails So Often: And How It Can Do Better*. Princeton University Press.

undertaking to write this dissertation on China's climate governance, with a focus on pilot programs. In order to produce sound policy interventions in the future, we need a much more credible theory. Thus, inspired by program evaluation theory, our key evaluation questions (KEQs) here are as follows: First, what is the design decision process of China's top planners and how do they prioritize things? Second, how do people translate the design decision into real world practice?

This dissertation provides an opportunity to step back and look at the broader picture of an evaluation process which should be developed for China's environmental programs, and the important considerations of implementing China's climate policy.

II. Background

POLICY CHOICES FOR CHINA

1. Is China being too ambitious? – China's climate policy package and interactions between China's climate policy programs

In contributing to global climate change mitigation efforts as agreed in Paris at the 21st meeting of the Conference of Parties to the United Nations Framework Convention on Climate Change (UNFCCC) in 2015, China set a target of reducing the carbon dioxide intensity of gross domestic product by 60-65 percent in 2030 compared with 2005 levels. In order to meet this Nationally Determined Contribution (NDC), China announced in its new Five-Year Plan (the 13th Five-Year Plan) that by 2020, China will have slashed energy consumption per unit of GDP by 15 percent.[10]

Besides the NDC, the serious air pollution and haze problem, especially in northern China, is the main reason that shifted China's primary environmental focus to climate change. Facing strong public pressure as a result of considerable government attention and support, many of China's environmental programs and their pilot schemes have undergone rapid development. During the 12th Five-Year Plan (FYP) period (2011-2015), China's climate laws and agency rules for achieving its climate targets have shown growing ambition of building a low-carbon economy.

There has been debate on whether China is ready or being too aggressive. For example, some of China's lessons or experiences for the newly launched national ETS have come from pilot programs where governments and companies have barely "tinkered" with cap and trade in two provinces and five cities[11] - and in this sense they are poorly informed about what policies might accomplish nationwide, which may lead to trading chaos in the future.

Also, according to some studies, implementing too many instruments as well as the lack of efficient design and coordination in between can lead to cost-inefficiency in the climate policy package. For instance, India has enough laws for regulation and protecting the environment, but a careful review of the environment protection laws clearly indicates that it is more of a reactive response to an emergent situation rather than a carefully planned preemptive strategy to control degradation of the

---

[10] Jing Cao Mun Ho Govinda R. Timilsina., no. 2 above.

[11] Fialka, J., & ClimateWire. (2016, May 16). China Will Start the World's Largest Carbon Trading Market. Scientific American. Retrieved from https://www.scientificamerican.com/article/china-will-start-the-world-s-largest-carbon-trading-market/.

environment.[12]

It is beyond the scope of this dissertation to demonstrate the optimal climate policy package in order to build a green, low-carbon and climate-resilient economy. However, policy recommendations will be made to help build a procedure in advance to evaluate the necessity and feasibility of future environmental programs and policy choices, as well as the re-evaluating process for existing programs and policies which might be no longer needed. With valuable information provided from retrospective evaluations of environmental programs, policymakers will be better able to determine what policies to adopt and how to design them in the future, which can also help identify ways to change existing policies to make them more beneficial.[13]

2. China's 13th Five-Year Plan and its market-based approach to the energy sector

As a socialist economy, China run its economy on Five-Year Plans. China's FYPs contain detailed guidelines for all its regions, aiming to map strategies for economic development, set growth targets, and launch reforms. These series of social and economic development initiatives and planning play a significant role in China's climate change policy, guiding the environmental policy-making and program planning. In fact, most of China's climate governance policy initiatives, including the pilot ETS programs, are launched by the NDRC through this periodic legislative document known as the FYP.

In November 2013, China's new leadership set the goal of overall market reform, with the objective to "speed up the improvement of modern market system and improve the market pricing mechanism." It was an important document that launched a more determined wave of China's so-called "comprehensively deepening reform", heavily emphasizing a more cost-efficient market mechanism. Many believe that China today is closer than ever to a real market economy after more than three decades of self-proclaimed market economy-oriented reform.[14]

In January 2017, China's National Energy Administration (NEA) announced the latest FYP (2016-2020 period) for its energy sector, which confirms that shifting China's energy production mix toward cleaner energies is still at the top of the leadership's agenda,[15] and reducing carbon emissions is a fundamental element of China's 13th FYP. To achieve this objective, other than setting the target of reducing energy intensity by 15 percent and demonstrating that non-fossil energy sources are becoming a more important part of the Chinese economy, the China's 13th FYP has shown strong signal of supporting distributed solar photovoltaic (solar PV), establishing renewable energy green certificates trading system and setting the

[12] Sylvine. (2016, July 21). Lacunae In Environmental Law - iPleaders. Retrieved December 13, 2019, from iPleaders website: https://blog.ipleaders.in/lacunae-environmental-law/.

[13] Bennear, L. S., & Coglianese, C. (2005). Measuring Progress: Program Evaluation of Environmental Policies. Environment: Science and Policy for Sustainable Development, 47(2), 22–39.

[14] Hallding, K., Han, G., Davis, M., & Jürisoo, M. (2012). China's Carbon Emission Trading: an Experiment to Watch Closely. Retrieved from https://www.sei.org/publications/chinas-carbon-emission-trading-an-experiment-to-watch-closely/.

[15] Bloomberg Briefs. (n.d.). Retrieved December 13, 2019, from http://newsletters.briefs.bloomberg.com/document/4ez1h04mbudz3g1tny/sector-power.

benchmarking FIT price lower, which means less command-based subsidies and more market-oriented instruments. This is consistent with the expressed desire of the government to rely more on market mechanisms. Highlights of the China's 13th FYP also include the market-oriented reform of China's power sector and the oil and gas sector.

However, with the inertia of the planning-driven and command-based economy, innovators have had to confront a deep-seated bureaucratic skepticism about using markets,[16] accompanied by heavy government control and frequent intervention. Despite China's accelerated development towards a real market economy, its environmental governance, especially its political response to climate change, has always focused on the top-down regulatory powers of the centralized government,[17] and details about implementing these market-based environmental programs are depending on ongoing internal consultations and negotiations among policymakers. In contrast to a mature free-market economy safeguarded by a liberal democratic regime as it is known in western countries, China is still a developing market economy with power politics and a socialist political tradition.[18] This makes China a particularly unusual case when analyzing the market-based environmental program and its operation.

Provided that the anticipated development of FIT, ETS and energy use trading policies in China continues to grow in the future, this dissertation seeks to provide procedures that could hold government agencies accountable for real-world policy impacts and real outcomes that affect environment and climate change.

PROGRAM EVALUATION

Worldwide practices of environmental program evaluation have been conducted before the implementation of a regulation or program, to determine whether environmental programs or regulations should or should not be adopted. Unfortunately, compared to its immediate and easily measured costs, the benefits, such as emissions reductions, are long-term and difficult to measure. This has raised debate among environmentalists: whether people should suffer inefficient and possibly ineffective environmental programs, or risk giving up future environmental improvement.[19]

This debate, however, does not apply to China. Environmental program evaluation in China is conducted not before, but together with the implementation of new regulations and programs. And its purpose is not to determine whether or not environmental programs and regulations should be adopted, but to figure out how. China has a long history of doing pilot programs since the 1980s, described as "crossing the river by feeling the stones" – a famous saying coined by Deng Xiaoping. It is a reform theory and pragmatic method with Chinese characteristics, which refers to making active explorations and bold experiments while feeling out the rules and

---

16 Fialka, J., & ClimateWire., no. 11 above.
17 Shen, Y., no. 3 above.
18 Ibid.
19 Knaap, G. J., Kim, T. J., & Kim, T. (1998). Environmental Program Evaluation: A Primer. University of Illinois Press.

making steady progress when there is lack of existing experience in the practice – mostly for economic reforms and first-time trials, and this is done in particular from implementing various pilot programs.[20] At the risk of many uncertainties, China believes the perhaps inefficient or ineffective pilot programs, are in fact the most efficient and effective way of generating information for solving environmental problems, and not a single pilot program has been identified as a "failure".

It is very clear that under this circumstance, current and proposed environmental programs must be critically evaluated, not to identify program failure or success, but to improve these programs themselves. A renewed and greatly expanded commitment to program evaluation of environmental policy would help move decision-making closer to evidence-based practice.[21] Meanwhile, evaluating the costs of alternative policies is critical to policy choices and the overall design decision. Improvement requires information on how programs are conducted, how they affect the natural environment, and how evaluations can be used to facilitate programmatic change. Environmental program evaluation can and should be used to improving existing programs and to design better new ones.[22]

Despite the urgent need, systematic environmental program evaluation theories and research in China are nowhere to be found. There is limited information available about some pilot projects' performances, but the information is not organized. Most people focus mainly on a regulation's substance, rather than the process by which it is enacted and its ability to promote stability in government policy for the operation of markets and the decisions of investors. "Yet, whatever account is best in the abstract, regulatory law has failed utterly to examine the evolution of regulation and how it interacts with changes in technology, economic conditions, and political preferences."[23] Some state-owned companies, local agencies, or even environmental consultants might have access to the policy design process, but they tend to care only about the future official supportive documents - like surfers in waves of reforms - waiting and observing, hoping to catch and ride the next good wave. However, with a lack of data, loose market rules and "flexible mechanism" but no careful evaluation, this pattern intends to help draw market speculators into emissions trading and other environmental pilots. Wealth and power have come in waves that lift the big boats, swamp or sink many smaller ones, but with no mechanism to bail out those who have been swimming naked.

The time for thinking about China's environmental programs and its evaluations could not be better. As stated by Robert Bartlett, "Clearly desirable are multiple evaluations, done with a keen appreciation of the strengths and limitations of each approach and a frank recognition of the advantages of others."[24] Decisionmakers often lack carefully collected evidence about what policies have accomplished in the past – and what new policies might accomplish in the future. While intuitions and

---

[20] Original resource in Chinese: *韩振峰："摸着石头过河"改革方法的来龙去脉*. Retrieved at: http://theory.people.com.cn/n/2014/0421/c40531-24920132.html.

[21] Bennear, L. S., & Coglianese, C., no. 13 above.

[22] Ibid.

[23] Rossi, J. (2005). Regulatory Bargaining and Public Law. Cambridge University Press.

[24] Knaap, G. J., Kim, T. J., & Kim, T., no. 19 above, at pp. 2.

research may provide some reason for suspecting that a given policy has made or will make a difference, the only way to be confident of such suspicions is to evaluate the policy impact in practice.[25]

However, compared with other fields of public policy, environmental policies have generated relatively little systematic program evaluation research. "Because environmental program evaluation is fraught with uncertainty regarding the behavior of individuals and institutions, the responsiveness of natural environments to anthropogenic influence, and the costs and benefits of environmental change, environmental programs cannot be evaluated, except in the most general terms." For example, pollutant emissions translate to different concentrations in the air and water based on geographic and geologic factors, and the health effects of exposure to these concentrations can vary with age, activity levels, current health status, and other factors. This complexity may sometimes make it infeasible to directly measure the impact of a program. Also, in reality, instead of actually observing both sets of outcomes for each area, researchers can only observe concentration levels of regulated areas and the pollution levels for other nonregulated areas, unless they can travel back in time and do retrospective measurement.

Under these challenges, how can researchers establish a reliable causal link between environmental policies and outcomes? A comprehensive answer to this question is beyond the scope of this dissertation, but an environmental program can properly be said to be effective only if it has a causal effect on the outcome. In observational studies where, strict random assignment does not hold, where policy may be correlated with other determinants of potential outcomes, more sophisticated methods are required to isolate the causal effect of the program.[26] "Only with more efforts to give priority to program evaluation research will decision-making over environmental policy be able to become based more on careful deliberation than on rhetorical and political contestation."[27] Environmental program evaluation will be a necessary step toward an evidence-based approach to environmental policy-making.

PILOT PROGRAMS DEFINITION AND SELECTED CASES

A pilot program, pilot study or pilot experiment is a small scale, short term experiment conducted that helps an organization learn how a large-scale project might work in practice.[28] It is also called a feasibility study or experimental trial, implying that a preliminary study will be conducted to evaluate feasibility, time, cost, adverse events, and effect size (statistical variability) in an attempt to predict an appropriate sample size and improve upon the study design prior to implementation of a full-scale research project.[29]

A demonstration program, unlike a demo in the business field, refers to a project

[25] Bennear, L. S., & Coglianese, C., no. 13 above.
[26] Ibid.
[27] Ibid.
[28] What is pilot program (pilot study)? - Definition from WhatIs.com. (n.d.). Retrieved December 13, 2019, from SearchCIO website: http://searchcio.techtarget.com/definition/pilot-program-pilot-study
[29] Hulley, S. B. (2007). Designing Clinical Research. Lippincott Williams & Wilkins., at pp.168-169.

conducted by an organization, or under its supervision, to provide competitive grants to, or enter into contracts with, eligible entities to do experiments, expand and improve the services authorized by this organization. In contrast to a pilot program, a demonstration program in China often stands for a selected model pilot which is meant to "set a fine example" for others and is not allowed to fail. Provided that not a single pilot program in China is defined a failure, a demonstration program and a pilot program, under most circumstances, share the same function, with a distinction that the former may represent a higher honor, signaling government's strong confidence.[30] In this sense, occasionally there is also a so-called "demonstration pilot" in between.

Other than the pilot ETS program and the pilot energy use trading program, three possible scenarios were examined as to be the selected case for pilot programs of China's renewable energy sector in this dissertation. One possible scenario is a series of "fine examples", including energy saving and emission reduction demonstration base and demonstration power plant, distributed solar PV power generation demonstration area, concentrating solar power (CSP) generation demonstration project, as well as pilot solar PV power generation project in China's selected poverty area.

In such a scenario, the NDRC selects the first batch of demonstration project, based on a review of all the project applications reported from the local government, and a FIT may only be applicable to this first batch. Moreover, local government will be notified by the NDRC, stating that the local government shall take multiple measures such as tax deduction, subsidies, green credit, and the land pre-emption right for these demonstration projects to promote the development of the industry. In other words, these projects will have full approval throughout. This makes the review process particularly important.

Another possible scenario is the decision design process of setting the benchmarking FIT price for solar PV, which aims to encourage solar PV power generations to meet a certain capacity, to support the healthy development of the solar PV industry, without blind expansion by heavily relying on high government subsidies.

However, when comparing these two scenarios to the pilot reform of China's electric power system, all the demonstration programs in the first scenario are less likely to form a national scheme; meanwhile, discussion of the pricing policy for China's climate governance in the second scenario will be pretty much covered when analyzing the progressive carbon price and a possibly more market-driven electricity price as an important part of the other selected cases.

Using a case study of electric power system reform to draw general lessons, the evaluation framework may prove applicable in evaluating other research programs, including series of demonstration bases, demonstration power plants, demonstration areas and demonstration programs.

Setting the metric for program success as demonstrating an impact on outcomes is laudable. Ideally, the National Development and Reform Commission (NDRC) will

[30] In government announcements, a lot of times, pilot programs are also designed to "setting fine examples".

establish a truly national market for carbon emissions, electricity, and energy use trading. In the meantime, given the poor oversight capacity of government agencies, the NDRC must evaluate the practical outcomes and public interest in selection of the model pilot programs, rather than leaving this decision entirely within the realm of internal consultation and negotiations among policymakers.

Chapter 1 Energy, Electricity and the State

In the introductory chapter, this work discussed the climate policy choices for China and the background of China's pilot environmental programs. These involve more ambitious (or inexperienced) determination and a market-oriented transition from the decision-making level over China's climate governance. Understanding the fact that China's once carefully controlled energy industry has become more market-driven due to clear signal from the political leadership about the value of greener energy mix is essential to understand China's current climate policy and its reformation. The introduction chapter also presents that many kinds of environmental policy pilots are being carried out as important components of China's market-oriented reforms and climate policy package, which require us to rethink China's current environmental policy process because it seems to effect policy variation only on a temporary basis.

In this chapter, this dissertation further explores China's key government institutions and allocation of authority over climate-related issues. As previously discussed, China ran its economy on Five-Year Plans, and most of China's climate governance policy initiatives are launched by the NDRC through these Five-Year Plans (FYPs), which makes the NDRC the single most important actor on climate-related issues in China, however, with relatively fragmented allocation of authority and highly dispersed regulation and management. This is particularly evident in the energy sector and is described as "nine dragons running the energy sector[31]". It is essential to clarify their functions and power both at the state level and the provincial or local level. This chapter provides an institutional analysis of the relationship between divisions of key climate governance authorities within the national government and between it and the provinces. The following sections also consider several power producers, industry associations and institutes as their roles become most relevant in their respective fields in this changing time.

Like other legal literatures, it is best to start with some basics about China's energy system and carbon emissions, because it defines the stage where China is and its current energy mix. The following sections of Part one examine China's electricity sector in particular and involve discussions of varies kinds of electricity producing resources, both traditional fossil fuels and renewable energy.

Aside from that, Part two explores several universal topics behind the electric power industry in whatever country it may be. These include energy security and supply and demand of electricity, the essential role of economics in understanding the electric power industry, the relationship between the state and local agencies regarding public governance of energy resources, and power politics. Moreover, these important considerations should take China's unique characteristics and situations into account.

Only after discussing these major issues does the dissertation goes through the general structure of government and markets and key government institutions related to energy and climate issues. Part three provides an institutional analysis of

[31] From *九龙治水，各管一摊*: Nine sons of dragon tame a river, which reflects a management pool with fragmented authority.

the numerous agencies, departments, bureaus, administrations, leading groups or offices involved in China's energy regulation and management, as well as a quick glance at China's former state-owned power producers, industry associations and institutes.

Last but not least, Part four goes into discussions of China's energy regulation regime as a whole and whether this hybrid energy governance model will always be necessary in China. These discussions are fundamental preludes to understanding why an evaluation process for China's environmental programs should be developed.

I. Part One: China's energy system and carbon emissions – The stage where China is and its current energy mix

China's economic growth has been powered by a coal-dominated surging fossil fuel consumption resulting in the highest emission levels for greenhouse gas (GHG) in the world[32]. Regional uneven development concentrates most of its population, energy consumption, economic activities, and emissions[33] in the coastal regions of the east and south China, whereas most of China's coal and so many of its coal-fired power generations are in the north[34] of the country. The environmental impact of China's current energy mix is evident with the overall severe air pollution in its mega-city clusters and the energy-based provinces.

ENERGY USE AND CARBON EMISSIONS BY ECONOMIC SECTOR

In 2012, China's total energy consumption was 402138 (10,000 tons of SCE)[35], and China's carbon emissions from fossil fuel burning and cement production were 8.50 Gt CO2[36], making it the country with both the largest energy consumption and emissions in the world. There are reports show that China surpassed the U.S. and became the world's largest energy consumer and carbon emitter in 2009 and 2007, respectively. Around 2010, China and its governmental authorities were reluctant to accept this "world's No.1 emitter" hat, and in response to state that China's per capita energy consumption and carbon emissions are lower than the level of the U.S. and the E.U. average[37]. However, although these discussions are essential to obtain a more holistic understanding of China's position, as the annual per capita emissions in major developed countries had already reached their peaking point and had decreased, and as China's top leaders started to openly confront the "world's No.1 emitter" hat and become dead serious[38] on greener energy mix and lower carbon emissions, the per capita and per GDP discussions turn out to be no longer important

---

[32] Jin, Y., Andersson, H., & Zhang, S. (2016). Air Pollution Control Policies in China: A Retrospective and Prospects. International Journal of Environmental Research and Public Health, 13(12). https://doi.org/10.3390/ijerph13121219 https://doi.org/10.3390/ijerph13121219

[33] Recent vehicle emissions have become an increasing problem in China's urban areas.

[34] Also called the three-north (sanbei), which refers to northeast, north and northwest China.

[35] Press, C. S. (2011). China Statistical Yearbook. 2016. Pekin ISBN, 9787, 5037–6351.

[36] Liu, Z. (2016). China's carbon emissions report 2016. Retrieved from https://dash.harvard.edu/handle/1/29916843

[37] Original resource in Chinese: *能源消费排名第一深意何在？---国家能源局*. (n.d.). Retrieved September 25, 2019, from http://www.nea.gov.cn/2011-08/15/c_131084137.htm

[38] China is dead serious on its greener energy mix. (n.d.). Retrieved September 25, 2019, from Asian Power website: http://asian-power.com/power-utility/exclusive/china-dead-serious-its-greener-energy-mix

for this dissertation.

1. Energy consumption:

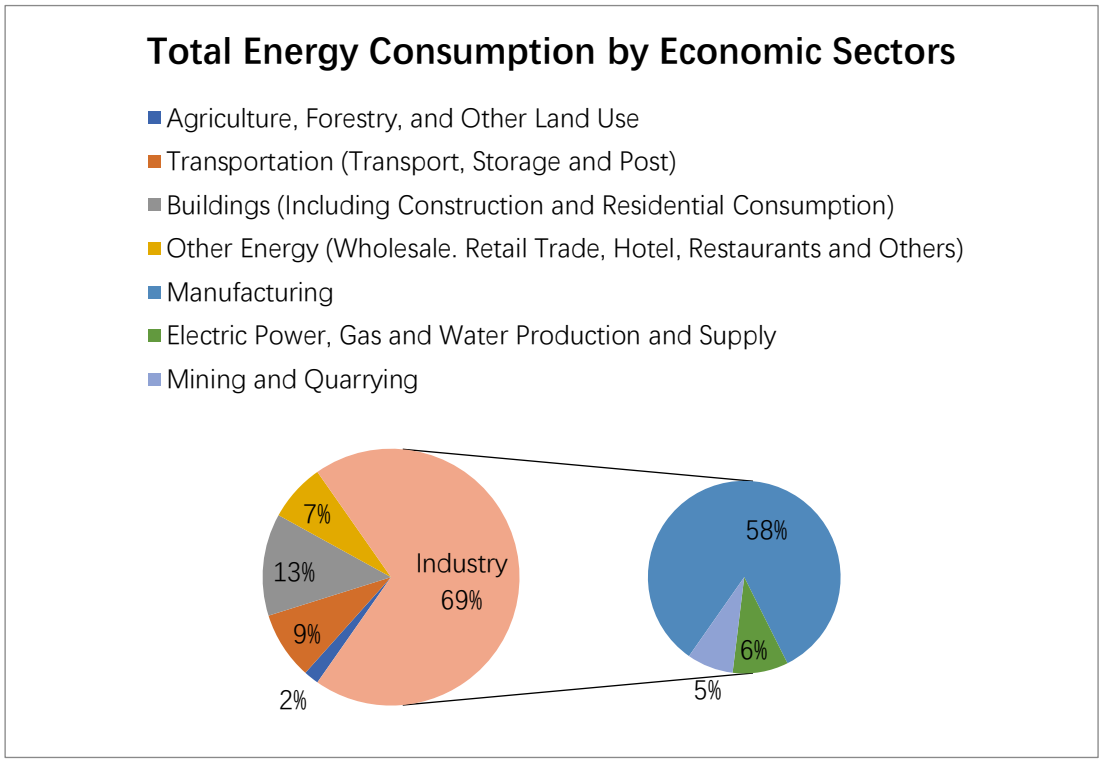


Figure 1.1: Sector share of energy consumption of China (2014)[39]

Among the economic sectors, according to the China energy statistics year book, the industry energy share is about 70%, which also shows the important role of industry sector energy use[40]. Within China's industrial sector, the manufacturing subsector accounted for nearly 58% of China's energy consumption (see Fig. 1.1), and six industrial subsectors – electricity generation, steel, non-ferrous metals, construction materials, oil processing and chemicals – account for nearly 70% of energy use in 2011[41]. Such patterns differ with each sector's proportion of energy use from other major energy consumption countries, especially from the developed countries where the energy consumption and emissions are mainly from the transportation, electricity, and agriculture sectors. For example, in the U.S., the transportation sector accounted for nearly 28% of the country's energy use in 2015[42].

2. Carbon emissions:

Carbon emissions are mainly the result of fossil fuel combustion and cement

[39] Total energy consumption chart. Percentage are rounded to the nearest whole number. Data collected and calculated from China statistical yearbook 2016. Press, C. S. (2011). China Statistical Yearbook. 2016. *Pekin ISBN*, *9787*, 5037–6351.

[40] Zhou, S., Kyle, G. P., Yu, S., Clarke, L. E., Eom, J., Luckow, P., … Edmonds, J. A. (2013). Energy use and CO2 emissions of China's industrial sector from a global perspective. Energy Policy, 58, 284–294.

[41] IBP, & Inc. (2015). China Energy Policy, Laws and Regulation Handbook Volume 1 Strategic Information and Basic Laws. Lulu.com.

[42] Wikipedia contributors. (2019, December 8). Energy policy of the United States. Retrieved December 13, 2019, from Wikipedia, The Free Encyclopedia website: https://en.wikipedia.org/w/index.php?title=Energy_policy_of_the_United_States&oldid=929893857

production. Cement production produces more carbon emissions than any other industrial process, accounting for around 4% of global carbon emissions. In 2012, China produced about 2.3 billion tons of cement, accounting for 60% of the world's total cement production. China's cement production from 2010-2012 was already higher than the total cement production in the U.S. was for the entire 20th Century[43]. Also noteworthy is that China is a country with significant regional differences in terms of technology, energy mix, and economic development[44]. The distribution of carbon emissions varies a lot among the 30 mainland provinces. The high level of total emissions in China's eastern coastal regions can be a result of the high population intensity; however, the high level of per capita carbon emissions in China's underdeveloped regions can be explained by the fact that these regions are rich in fossil fuel resources and are serving as energy and resource bases which provide the electricity and industrial materials that have been consumed in other developed regions. This is important for the discussion on China's national ETS and its regional pilot programs in the following chapters.

3. Economic sectors which China planning to cover in its national ETS:

According to preliminary guidelines from the NDRC, China's national ETS planned to cover eight broad industries in the first stage, including petrochemicals, chemicals, construction materials, iron and steel, non-ferrous metals, pulp and paper, power generation and aviation[45], accounting for more than half of the country's carbon emissions[46]. However, due to unreliable industrial data and other regulatory problems, China's national ETS has faced delays and the first batch of industries covered is narrowed down to three instead of eight, that is, power generation, cement, and aluminum, which have relatively more organized base data.

ELECTRICITY

At the annual Central Economic Work Conference on December 2016, China's top leaders, economic planners, and policymakers sketched out and reached a consensus on a supply-side structural reform with continuing reduction of steel, iron, and coal capacity.[47] The Conference also stated that a "mixed-ownership" reform of state-owned enterprises (SOEs, or so called state-run firms) will be the a key breakthrough for 2017 with the electricity sector at the forefront, and the "mixed-ownership" investment deals of all the state-owned electric power companies will be completed by the end of 2017. This is the boldest move that China's central government has made so far in its state-run sector. The supply-side structural reform and the "mixed-ownership" reform together stand as the most important contents of

---

43 Liu, Z., no. 36 above.

44 Feng, K., Davis, S. J., Sun, L., Li, X., Guan, D., Liu, W., … Hubacek, K. (2013). Outsourcing CO2 within China. Proceedings of the National Academy of Sciences of the United States of America, 110(28), 11654–11659.

45 Governmental resource in Chinese: *发展改革委通知切实做好全国碳排放权交易市场启动重点工作 部门新闻_中国政府网*. (n.d.). Retrieved December 13, 2019, from http://www.gov.cn/xinwen/2016-01/22/content_5035432.htm.

46 Original resource in Chinese: *中国八大重点行业碳排放量占全国一半_碳排放【中国碳交易网】*. (n.d.). Retrieved December 13, 2019, from http://www.tanjiaoyi.com/article-19460-1.html.

47 *赵婷婷*. (n.d.). NDRC: Overcapacity top reform priority for 2017 - Business - Chinadaily.com.cn. Retrieved December 13, 2019, from http://www.chinadaily.com.cn/business/2016-12/19/content_27704028.htm

China's electricity system reform and electric power environmental protection. Reducing the carbon intensity of electricity generation in a key component of climate policy package as decarbonization happens more rapidly in electricity generation than in the buildings, transport, and industry sectors.[48] Thus, the electricity sector is under the government spotlight due to its important role in helping China's transition to a lower total energy consumption and carbon emissions economy, and in addressing local air pollution. Key elements of this transition include cutting excess production capacity and introducing the market mechanism into China's former state-run industries.

1. Basics about the institutional history and evolution of China's electricity sector

Different to other countries with liberalized electricity market, the regulatory reform in China's electricity sector is still very much in progress. Historically, China's electricity sector was tightly controlled and operated by the former State Power Corporation (SPC, established in 1997), which is a state-owned vertically integrated company, with 46% of nationwide installed capacity and 90% of transmission asset. On December 29, 2002, the Scheme of the Reform for Power Industry unbundled the monopoly SPC and divided it into five regional electric power companies and two transmission companies (shown in Fig. 1.2). In March 2003, the State-owned Assets Supervision and Administration Commission (SASAC), a special commission directly under the State Council (the Central Government; SC) in charge of managing SOEs, was created. It immediately formulated clear performance evaluation programs to encourage more profit-oriented behavior by management[49]. It was said by the report that Huaneng, Datang and Guodian – the top three firms – emitted more greenhouse gases (GHGs) than the whole of the United Kingdom in 2008.

	Former SOEs	**Region**
Electric Power Companies (The generating assets)	China Huaneng Group	North China, East China and South China
	China Datang Corporation	North China
	China Huadian Corporation	Guizhou, Heilongjiang, Xinjiang and Sichuan Provinces
	China Guodian Corporation	North China, Central China and East China
	State Power Investment Corporation	East China
Grid Companies	State Grid Corporation of	The remaining regions other than Guangdong, Guangxi, Yunnan, Guizhou

[48] Edenhofer, O., & Others. (2014). Technical Summary In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Technical Report, at pp. 69. Retrieved from https://kar.kent.ac.uk/53240/.

[49] Gao, H., & Van Biesebroeck, J. (n.d.). Effects of Deregulation and Vertical Unbundling on the Performance of China's Electricity Generation Sector. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.1966941.

(The transmission assets)	China	and Hainan provinces (The rest of the nation)
	China Southern Power Grid Corporation	Guangdong, Guangxi, Yunnan, Guizhou and Hainan provinces

Figure 1.2: The assets distribution of China's big five power producers and two grid companies

The government also created a specific independent regulatory agency: The State Electricity Regulatory Commission (SERC), as the main regulator over electricity, to supervise and propose strategy to establish a market-oriented pricing mechanism for electricity. However, the SERC has never been given the right for planning, project approval or rate-making. Key decision-making authority is still hold by the National Development and Reform Committee (NDRC), a powerful ministry in lead of economic planning and macroeconomic control in China. Moreover, the former state-owned enterprises (SOEs) of China's electricity sector, particularly the State Grid Corporation, are only lightly regulated. In fact, they are often more powerful than the SERC. For example, the State Grid and the China Southern Power Grid currently have a monopoly of retailing for almost all customers, apart from large electricity users who can self-generate, and are frequently involved in the decision-making process in Beijing on energy governance issues, leaving the SERC with few direct options for enforcing the rules.

The main purpose of the 2002 reforms was to improve production efficiency and to introduce real competition in the electric generation sector. However, China has shown a strong tendency for the large SOEs to unabashedly eliminate smaller competitors. Moreover, in the monopoly sectors in China, government functions and business operations were not generally separated[50]. As a result, the electricity pricing and dispatching policies are now still significantly under the mandate of NDRC.

In 2013, the Chinese government announced a reform plan which merged SERC into the National Energy Administration (NEA, being mandated by the NDRC) with a hope to strengthen the regulatory reform of the electricity sector. However, the centralization of the regulatory reform has entailed so far negligible impacts on the reform of electricity pricing and dispatching toward a competitive electricity market in China given the short time of institutional adjustment[51].

Before 2013 and President Xi (elected March 2013), for a long time, China has been characterized by imbalance of power development, preference on poor power dispatch decisions over fair competition, as well as high level of corruption and energy waste. Moreover, a true market-oriented reform of China's state-run electricity sector was stalled around 2007[52], and was neither predictable nor hopeful

[50] Xu, S., & Chen, W. (2006). The reform of electricity power sector in the PR of China. Energy Policy, 34(16), 2455–2465.

[51] Teng, F., Wang, X., & Zhiqiang, L. V. (2014). Introducing the emissions trading system to China's electricity sector: challenges and opportunities. Energy Policy. Retrieved from https://www.sciencedirect.com/science/article/pii/S0301421514004637.

[52] Pollitt, M., Yang, C.-H., & Chen, H. (2017). Reforming the Chinese electricity supply sector: lessons from

to take place. There has been lots of literature analyzing possible ways to provide governmental incentives for promoting China's renewable energy development during that period, one prospective solution of which is to encourage big SOEs to step into the renewable energy industry.

During January and February in 2013, severe smog covered many provinces and cities in China, due to its extremely high pollutants concentration and low visibility. It rapidly expanded into a social crisis and eventually became of worldwide concern. Responding to the crisis, the State Council and the former Ministry of Environmental Protection (MEP, merged into the Ministry of Ecology and Environment in 2018) issued a series of actions and plans in June 2013 and later in September. The strong political will was further solidified in Li Keqiang's speech in September 2013 and then later in the 2014 Government Work Report that China shall treat pollution with "iron fists" and shall "punch hard". This triggered the latest waves of policies aiming to transform China's electric power industry towards a greener energy mix with lower emissions. However, literature believes these policies do not necessarily suggest that China is undergoing fundamental reform on its own initiative[53]. Rather they were triggered by external force, driven by social development, and can reflect some everlasting features deeply rooted in the political culture and institutional logic of China's governance system. For example, when there is a short-term goal, such as a mega event, China's government agencies can quickly mobilize all kinds of capacities and even effectively suspend all regular activities to make sure that all the resource and attention are gathered to fulfill some special situations of need.

However, after six years since the crisis, new policies and pilot programs are still emerging and the electricity sector is likely to experience major changes and a comprehensive reform. From what have happened it seems that it will not stop as a temporary expedient this time. The increase in social mobility and public participation, awareness of civil rights, development of advanced information technology keeps pushing the government forward. The government now has less space to implement regulations in a flexible way. Instead, the performance of governance in today's China is becoming more "standardized, normalized and legalized[54]".

2. Electricity transmission infrastructure and energy dispatch policy in China
    a. The 13th FYP and China's ultra-high voltage (UHV) grid

The distribution of energy resources and economic development in China is very much imbalance – most coal reserves are buried in the north and northwestern areas and the two areas account for 80% of the country's total reserve, while the west and southwestern areas abound in hydro resources and make up 82.09% of the total exploitable amount in the country. For years, struggling to alleviate the pressure from this extremely unbalanced energy distribution, the government has implemented strategy of transmitting power from western provinces to the developed eastern

international experience. Retrieved from https://www.repository.cam.ac.uk/handle/1810/292007.

[53] Jin, Y., Andersson, H., & Zhang, S., no. 32 above.

[54] Ibid.

coastal area – the vast "West-to-East power transfer" project since the early 2000s. However, this strategy is impeded by serious market, technical, and administrative problems[55]. For example, congestion on the transmission grid limits the possibility of satisfying local demand with faraway supply.

In practice renewable energy are also constrained off by a combination of binding constraints from transmission capacity, which caused a bottleneck that has left large amount of clean power idle. China must upgrade its transmission system to facilitate renewable energy access to the transmission network - for example, to support distributed solar photovoltaic (solar PV) power systems' connections to existing power grids.

But from now on, these barriers may be overcome step by step along with the reform of China's electricity sector. In 2016, the power transmission companies have been ordered by the NEA to plug in all renewable power sources that comply with their technical standards.[56] Under the current Five-Year Plan (13th FYP: 2016-2020), an ultra-high voltage (UHV) long-distance power transmission cable will be further invested, enhanced and expanded to support development of China's UHV transport capacity. The target of 270 GW of capacity seems set to be exceeded; total capacity of UHV projects built, under construction or approved for construction already stood at 312 GW, with a total line length of 32,000 km, halfway through 2016.[57] Many of these lines connect with wind and solar power bases.

In October 2018, for the purposes of further supporting China's deepened supply-side structural reform[58], the General Office of the SC announced the "Guiding Opinions on Maintaining Efforts to Remedy Shortcomings in Infrastructure Field"[59] which declared the launch of a new round of rural power grid improvement and upgrading projects, and promoted a number of new UHV electric power transmission projects, with a total investment of nearly one trillion RMB. According to the mid-term evaluation report of the 13th FYP by the China Electricity Council, it is highly possible that China will increase its development target of "West-to-East power transfer", UHV transmission and grid upgrading constructions.

b. Power distribution network, energy storage and the network of smart grids

Various renewable energies are also restricted by a desire to help fossil fuel power plants to meet their annual hours target, allegations of unfair behavior by the transmission companies in charge of power dispatch, and lack of interregional

---

[55] Xu, S., & Chen, W., no. 50 above.

[56] China pushes for mandatory integration of renewable power. (2016, March 28). Reuters. Retrieved from https://www.reuters.com/article/us-china-power-renewables-idUSKCN0WU0RF.

[57] Gosens, J., Kåberger, T., & Wang, Y. (2017). China's next renewable energy revolution: goals and mechanisms in the 13th Five Year Plan for energy. Energy Science & Engineering, 5(3), 141–155.

[58] A series of structural adjustments and deleveraging campaign started 2016, aiming to eliminate China's excess capacity and to improve the quality of economic growth.

[59] Governmental resource from China SC General Office [2018] No. 101 (this is a typical way of sorting administrative regulatory documents in China), Guiding Opinions of the General Office of the State Council on Maintaining Efforts to Remedy Shortcomings in Infrastructure Field [Effective], retrieved from http://en.pkulaw.cn/display.aspx?id=900647650fa99086bdfb&lib=law&SearchKeyword=&SearchCKeyword=%bb%f9%b4%a1%c9%e8%ca%a9; Original resource in Chinese: http://www.gov.cn/zhengce/content/2018-10/31/content_5336177.htm.

transmission capacity. Major electrical infrastructure challenges, such as maintaining grid stability, improving the flexibility of coal-based power, developing smart grid system and energy storage technology, enhancing a greener power distribution network which will prioritize power generation from renewable sources, as well as the most efficient and lowest-polluting fossil fuel generators, would need to be overcome in order to achieve this change in energy mix.

3. The rise of regional electric power producers and local governance of energy

Beginning in the 1980s, China's electricity sector has grown more decentralized, with provincial governments increasingly in control of generation assets and provincial grids. As a result, many large provinces contain regions where power producers are local monopolies. There is substantial inefficiency in regional power flows. There are also administrative barriers and regional competition between provinces in China that block trading of power. Exchanging power between provincial areas is still limited due to the lack of a well-developed electricity market where power generation could be pooled together and exchanged among provinces. Also, China's financial system and individual provincial grids, and local protectionism have led to a serious waste of resources.

One of the most shard experts' ideas is regional cooperation mechanisms, to unify and make standards consistent. This is taking substantial steps in some regions of China, where special working panels coordinate joint meetings and draft cross-regional plans and key inter-regional cooperation tasks. Also, as a result of growing dissatisfaction and concern about the severe pollution and environment issues, a mushrooming of provincial leading groups on climate change has been noticed.

CHINA'S ELECTRICITY SOURCES AND CURRENT ENERGY PRODUCTION MIX

Before the discussion of appropriate reform steps to take in China's electric power industry in the following chapters, it is important to acknowledge the size of each capacity type and generated electricity under state-run.

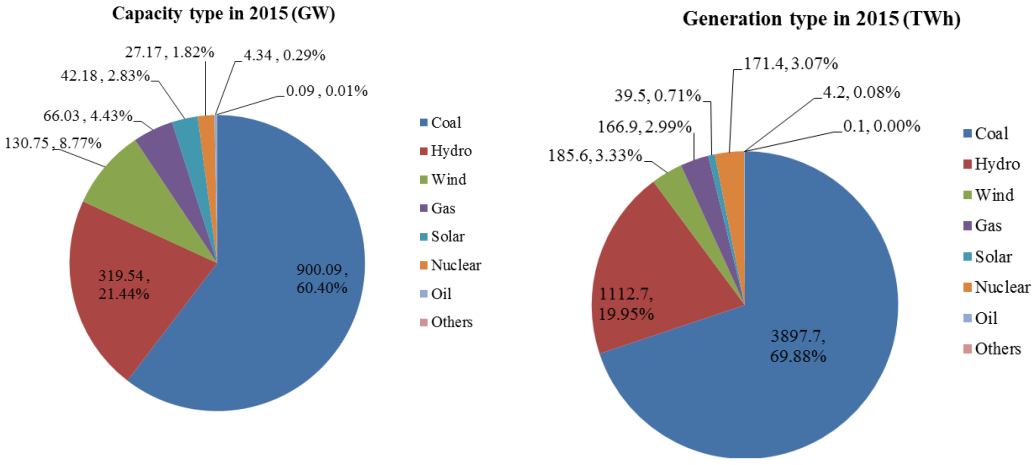


Figure 1.3: The size of the 2015 Chinese electricity sector

1. Coal

China is heavily reliant on coal as its basic fuel for producing power. The environmental impact of these coal-fired power plants is evident with the severe pollution in major cities. Most of the electricity in China comes from coal, which accounted for 70% of the electricity generation mix in 2015. Over the past 10 years, China has accounted for almost half of all the coal production and consumption in the world and since 2011, China has consumed more coal than the rest of the world combined. Additionally, household and small commercial users of civil bulk coal and civil briquette represent only a small number of China's total coal consumption, but they do not have the filtering systems of bigger coal users. These sporadic coal users in rural areas across Northern China contributed predominantly to severe brownish haze and very high pollution emissions, particularly during colder months when coal is widely burned for heat.

China is increasing the efficiency of coal burning power plants and also shutting down small and medium coal-fired stoves and boilers that fail to meet national standards, and has restricted construction of new coal-fired power plants. China's coal demand declined in recent years due to coal substitution in small industrial and residential boilers as well as higher efficiency in power, steel and cement industries. Assuming that the required major changes in electricity system reform, electricity transmission infrastructure upgrade and inter-regional cooperation mechanism are made, coal could account for approximately 50% of electricity generation in 2030, rather than the nearly 70% projected if the current high-polluting, energy intensive power system continues.

2. Oil and gas

China produces only about 5% of the world's petroleum products, and it will become the world's largest consumer by 2030 overtaking the United States at that time. China also began moving gradually to rely more on natural gas and committed to build up gas demand more than a decade ago. Today, China uses more oil that Russia, Japan, and India combined. It is now the world's largest net importer of oil. It is now also consuming considerably more natural gas than it produces, importing the difference. "The country also regulates the price at which state-controlled energy giants are allowed to sell natural gas, to encourage its domestic use as a cleaner-burning substitute for coal."[60]

In 2017-18 winter, the Chinese government decided to pick up the pace facing public pressure to clean smoggy skies and choking air for better health and quality of life. Based on the NDRC's "Clean Winter Heating Plan for Northern China (2017-2021)"[61], local government inspectors and energy authorities ordered schools, business and homes to shut down coal-fired stoves and boilers and switch to natural gas. They converted, dismantled and removed large number of coal-fired devices, and made sure that their orders would not be defied with threats of fines and other

[60] Original resource in Chinese: *中国快速推进"煤改气"致严重天然气短缺*. (2017, December 13). The New York Times. Retrieved from https://cn.nytimes.com/business/20171213/china-gas-coal/

[61] Governmental resource from China NDRC Energy [2017] No. 2100, Clean winter heating plan for Northern China (2017-2021) | China Energy Portal | *中国能源门户*. (2017, December 5). Retrieved December 13, 2019, from China Energy Portal | *中国能源门户* website: https://chinaenergyportal.org/en/clean-winter-heating-plan-for-northern-china-2017-2021/.

punishments. However, the unexpected cold whether triggered high demand for heating while the supply side of natural gas had not caught up, sending prices soaring and creating severe shortages. In some cases, construction on the new pipelines and gas furnaces needed had not been completed and installed, leaving tens of thousands of people without heat when winter arrived earlier than normal. Many people complained that the cost of keeping their homes warm was now much higher and prohibitively expensive. To free up natural gas to heat homes and schools, the government even shut down some big chemical factories. These problems and disruptions posed in 2017-18 winter appear temporary, but they have showed the painful and expensive process for China to break its coal addiction and clean up its air.

GHG emissions from electricity generations can be reduced significantly by replacing China's current coal-fired power plants with modern, highly efficient natural gas combined cycle power plants or combined heat and power (CHP) plants, provided that natural gas is available and the fugitive emissions associated with its extraction and supply are low or mitigated.[62] However, in the recent NEA's "requests for comments"[63] on the guiding suggestions of issues concerning promoting "coal to gas" and "coal to electricity"[64], China's plans of rapidly developing natural gas-fired heating and electric heating for Northern China were reversed and shifted back to developing clean coal-fired heating. It is still unknown that how this decision is going to shape China's future energy structure.

3. Renewable energy

Many renewable energy technologies have demonstrated substantial performance improvements and cost reductions, and a level of maturity to enable deployment at significant scale.[65] China is increasingly looking toward securing its future energy needs with sustainable alternatives. To reach emissions reduction goals set in the 12th FYP, China's energy production mix is set to diversify and shift away from traditional fossil fuels and towards greater proportion of renewable. In addition, various goals in the new 13th FYP have addressed systematically generation and transmission planning with renewable energy development. China is now becoming the largest market in the world for renewable energy.

a. Solar power and various pilot projects

1. Solar thermal demonstration projects

A first batch of concentrating solar power (CSP) generation demonstration using different types of technology and total capacity of 1.35 GW was approved on September 14th, 2016, and a Feed-in-tariff (FIT) of 1.15RMB/kWh will be applicable to these 20 demonstration projects in the first batch. Detailed selection process of various demonstration projects will be discussed in the following chapters.

---

[62] Edenhofer, O., & Others, no. 48 above, at pp. 70.

[63] 征求意见的函，it is widely used by China's government agencies in the policy-making process, with specific target authorities and entities listed in the circulars.

[64] Original resource in Chinese: *国家能源局综合司征求《关于解决"煤改气""煤改电"等清洁供暖推进过程中有关问题的通知》意见的函---国家能源局.* (n.d.). Retrieved December 14, 2019, from http://www.nea.gov.cn/2019-07/03/c_138195454.htm.

[65] Edenhofer, O., & Others, no. 48 above, at pp. 69.

2. Solar PV poverty alleviation pilot projects and China's rural electrification

The traditional centralized electricity supply model with its underlying countrywide network has offered high reliability and economic value. However, in case of developing countries such as China, it has also ignored the energy needs of rural areas, the poor households, and other disadvantaged groups. China's new solar PV poverty alleviation pilot projects aims to provide PV panels to 2.8 million households, generating 3000 RMB of additional income per household.[66] China has also proposed a new round of rural power grid improvement and upgrading projects in order to keep up with the growing needs for decentralized renewable electricity to be plugged into grid.

3. Distributed solar PV pilot projects and the first three batches of Solar PV Top Runner demonstration projects

The centralized electricity supply model with its underlying rural network has historically offered China and other developing countries high reliability and important economies of scale. However, in recent years, there has been a growing of interest in distributed generation including CHP plants, industrial gas turbines, small petroleum generators, and renewable technologies. Taken together, whereas the 12th FYP period saw a rapid build-up of solar PV mainly in large-scale PV power generations, the 13th FYP targets nearly all additional installations to be with distributed forms of PV.

Since 2015, the NEA has released three batches of bid winners of its Solar PV Top Runner Program, aiming to encourage more technological innovation and provoke more competition in the field.[67] However, the new standardization and assessment criteria for selecting candidates will depend on manufacturers and third-party certification institutions.

b. Wind power

Over the past decade, China has also emerged as the most dominant international actor in wind energy. China's electricity generated by wind power accounted for just 2.1 percent of its total electricity net consumption in 2012, compared to 3.7 in the United States and 9.4 percent in Germany.[68] By 2015, one out of every three wind turbines in the world is now in China, mainly installed in the nation's "three norths" regions[69]. China's wind power capacity in 2017 surged to 16,367 megawatts (MW), a 10.5 percent increase[70] from the previous year. However, a nationwide economic slowdown and a dearth of transmission lines to carry electricity from barren, mountainous provinces in the north and west to the fastest-

---

[66] To be discussed in detail in Chapter 4 of this dissertation.

[67] For details, see Promoting implementation of the PV "Leader" program and requirements for 2017 PV Leader base construction | China Energy Portal | *中国能源门户*. (2017, September 22). Retrieved October 8, 2019, from China Energy Portal | *中国能源门户* website: https://chinaenergyportal.org/en/promoting-implementation-pv-leader-program-requirements-2017-pv-leader-base-construction/.

[68] How is China's energy footprint changing? | China Power Project. (2016, February 15). Retrieved December 13, 2019, from China Power Project website: https://chinapower.csis.org/energy-footprint/.

[69] Northwest – north – northeast.

[70] Governmental resource in Chinese: *2017 年全国电力工业统计数据---国家能源局*. (n.d.). Retrieved December 13, 2019, from http://www.nea.gov.cn/2018-01/22/c_136914154.htm.

growing major cites of eastern China have caused an astronomically high level of curtailment on wind capacity. Many newly built wind farms were shut off and left unplugged due to a lack of demand for electricity locally. Over the long term, as the government pledges to curb the spread of coal-fired power plants, advocates for the wind industry contend that the wind power sector is very promising.

c. Hydrogen energy

As the simplest and the most promising energy source for the future, hydrogen energy has attracted more and more attention in recent years both nationwide and worldwide. In March 2019, SC's revised "2019 Report on the work of the Government" mentioned hydrogen energy for the first time in history, stating that the government shall "promote the construction of charging facilities, hydrogen refueling stations, and other infrastructures". Since then, China's local governments have quickly responded to the central government's call and brought forward many hydrogen energy industrial plans in succession, aiming to exert more influence nationwide. Nevertheless, China's hydrogen market is in its infancy with incomplete supporting policies and regulatory system. Hydrogen energy is now considered a part of the New Energy Vehicles (NEV) industry, and governmental authorities that oversee policy enforcement in this industry still have overlapping and ambiguous duties.

d. Bioenergy – biofuels, biomass, and bio-natural gas[71]

In December 2017, the NDRC and the NEA published the "Guiding opinions on promoting the development of biomass-based heat supply"[72]. Shortly after, in January 2018, the NEA issued the "circular on carrying out '100 cities and towns' clean biomass cogeneration demonstration project construction"[73] with 136 biomass cogeneration demonstration projects. And in June 2018, the NEA and MEE's "Circular on the pilot projects construction for the retrofitting for co-firing of coal and biomass" announced 84 coupled coal biomass power generating pilots. Also, according to the 2019 NEA's "Guiding opinions on promoting the development of the bio-natural gas industry (draft for comments)"[74], by the year of 2030, China's annual bio-natural gas output will reach more than 30 billion cubic meters, accounting for a significant share of both domestic and world natural gas production. China also has

---

[71] See http://zfxxgk.nea.gov.cn/auto87/201612/t20161205_2328.htm for NEA's 13th FYP development plan for China's biomass energy. *政府信息公开目录---国家能源局--国家能源局关于印发《生物质能发展"十三五"规划》的通知*. (n.d.). Retrieved December 13, 2019, from http://zfxxgk.nea.gov.cn/auto87/201612/t20161205_2328.htm.

[72] Guiding opinions on promoting the development of biomass-based heat supply | China Energy Portal | 中国能源门户. (2017, December 6). Retrieved December 13, 2019, from China Energy Portal | 中国能源门户 website: https://chinaenergyportal.org/guiding-opinions-promoting-development-biomass-based-heat-supply/

[73] Circular on carrying out "100 cities and towns" clean biomass cogeneration demonstration project construction | China Energy Portal | 中国能源门户. (2018, January 19). Retrieved December 13, 2019, from China Energy Portal | 中国能源门户 website: https://chinaenergyportal.org/circular-carrying-100-cities-towns-clean-biomass-cogeneration-demonstration-project-construction/. Original source in Chinese.

[74] Guiding opinions on promoting the development of the bio-natural gas industry (Draft for comments) | China Energy Portal | 中国能源门户. (2019, March 1). Retrieved December 13, 2019, from China Energy Portal | 中国能源门户 website: https://chinaenergyportal.org/en/guiding-opinions-on-promoting-the-development-of-the-bio-natural-gas-industry-draft-for-comments/. Original source in Chinese: http://www.nea.gov.cn/2019-03/01/c_137859911.htm.

set its target of clean biomass heating that by 2021, heated floor area with clean biomass heating will reach 2.1 billion square meters.[75] However, the Ministry of Agriculture and Rural Affairs recently revealed that only one third of the 64 state-funded bio-natural gas pilot projects are now completed and fully functional.[76] In the future, combining bioenergy with carbon dioxide capture and storage (BECCS) offers the prospect of energy supply with large-scale net negative emissions[77].

e. Hydropower and geothermal power

Hydropower power, mostly in the nation's southwest, will continue to be the principal renewable energy sources in China due to large-scale government investments in massive infrastructure projects.[78] The controversial Three Gorges Dam project, completed in 2012, is the largest hydroelectricity dam in the world. China launched the new Baihetan Dam project in 2008 with a 1GW hydrogenator, which is expected to be complete in 2021 - 2022. Meanwhile, China has also become a global leader for international hydropower projects in recent years under the influence of its "One Belt, One Road" Initiative[79]. By the end of 2018, China accounted for over 70% of hydropower construction projects in the overseas hydropower market.[80]

Medium and deep geothermal heating has characteristics of being clean, environmentally friendly, and a high capacity factor, and is mainly suitable for China's northern areas with very good geothermal resources and geological conditions that make for easy re-injection. China now has a development target for geothermal power that by 2021, the floor area heated with geothermal energy will reach 1 billion square meters, of which 500 million square meters with medium-depth and deep geothermal heating, and 500 million square meters with shallow geothermal heating (including electric ground source and water source heat pumps).[81]

f. Nuclear power

China is also turning to nuclear power to decrease its reliance on fossil fuels. Despite the barriers and risks associated with an increasing share of China's electricity generation, China's 13th FYP reaffirmed the country's commitment to nuclear energy and outlined plans to construct 40 additional plants by 2020.[82] It is now regulated under the newly established Ministry of Ecology and Environment. Because of the special characteristics of nuclear power, this dissertation will not cover in-depth discussions of China's nuclear industry.

---

[75] Clean winter heating plan for Northern China (2017-2021), no. 61 above.

[76] Original resource in Chinese: *发展缓慢！生物天然气试点项目中仅约1/3 建成在运！_政策*. | China Energy News (2019, May 17). Retrieved December 14, 2019, from http://www.sohu.com/a/314775483_468637

[77] Edenhofer, O., & Others, no. 48 above, at pp. 70.

[78] How is China's energy footprint changing? No. 68 above.

[79] A global development strategy adopted by the Chinese government involving infrastructure development and investments in 152 countries and international organizations in Asia, Europe, Africa, the Middle East, and the Americas, aiming to enhance regional connectivity and China's dominance in global affairs with a China-centered trading network.

[80] Governmental source in Chinese: *中国水电企业已占海外70%以上水电建设市场--国家能源局*. (n.d.). Retrieved December 14, 2019, from http://www.nea.gov.cn/2019-01/23/c_137767698.htm.

[81] Clean winter heating plan for Northern China (2017-2021), no. 61 above.

[82] How is China's energy footprint changing? No. 68 above.

II. Part Two: Climate and Energy Governance - Where Law Intersects with Science, Economic, and Politics

ENERGY SECURITY

China's energy regulatory agencies have mainly focused on the economic values of energy since their creation and have been bundled with public service in general. But as discussed earlier in this chapter, in the past five years, due to the growing dissatisfaction and concern about the severe air pollution and its implications for human health, government agencies were also frequently being challenged to address some climate change issues and the ecological value of energy, and they quickly came to realize that climate change mitigation is closely tied to energy conservation. However, energy security remains a significant part of national security and hence the top mission of China's energy regulatory agencies.

1. Demand for electric power

In modern homes and businesses, consumers cannot simply stop using electricity when it became expensive, because electricity has no substitute and demand for electricity is somewhat "inelastic". At best, consumers can only manage their daily use of refrigeration, temperature control, and lighting through conservation in order to reduce demand. Thus, there is no incentive for consumers to change their electricity consumption pattern if they are not exposed to or well informed about changes and variance in electricity prices. This was particularly true in China and most of other developing countries with a centralized electricity supply model - when most consumers received their electricity through a state-owned distribution utility with fixed rate approved by government regulations. It was only until very recently that China started to orderly open up electricity production and consumption planning[83] and carry out pilot projects for **market-oriented reforms for distributed power generation**[84]. However, additional supporting policies, revamps of the market access system and trading regulations, and new innovations are needed to make the demand for electricity in China's electric power market much more responsive to changes in price.

On the other hand, the non-storability nature[85] of electric power demand requires the demand for electric power must be met instantaneously by power generation supply. Generation companies must ensure demand as well as distribution for their electricity. Otherwise, their electricity would not be used and paid, and consequently spoiled. This explains the high curtailment rates of wind, solar and hydropower in northwest China due to the economic slowdown in recent years and a mismatch of electricity demand and supply. In order to strengthen a more balanced development of China's renewable electricity and reduce the waste, the NDRC and the NEA issued the final version of a **"safeguard mechanism" for**

---

[83] See original governmental resource in Chinese: http://www.ndrc.gov.cn/zcfb/zcfbtz/201704/t20170410_843769.html

[84] See original governmental resource in Chinese: *政府信息公开目录---国家能源局---国家发展改革委 国家能源局关于开展分布式发电市场化交易试点的通知*. (n.d.). Retrieved December 14, 2019, from http://zfxxgk.nea.gov.cn/auto87/201711/t20171113_3055.htm.

[85] Admittedly, there are ways of storing electricity, but it cannot be stored in high quantities or for long periods of time.

renewable electricity consumption[86] to guarantee minimum levels of regional renewable energy consumption in May 2019 - equivalent to a renewable portfolio standard (RPS) – which will become effective in 2020 for five years. Under this "safeguard mechanism", a minimum renewable electricity consumption quota (minimum consumption quota) shall be stipulated for each provincial-level administrative area, while an encouraged consumption quota will be determined based on a certain level exceeding the minimum consumption quota.

2. Supply for electric power

China holds the third largest coal reserves in the world. Yet China is characterized by a paucity of oil, and a dearth of other high-quality or high-quantity energy resources. With an overdependence on coal and imported oil, a lack of development of the ever-popular shale oil industry, China's falling reserves of all fossil fuels, and the decentralization of the national energy management system are the challenges confronted by China in the energy production sector.

Meanwhile, China's inefficiencies in the polysilicon raw materials manufacturing industry has retarded the growth of the solar PV industry as a whole. China is one of the world's major suppliers of 80% of all upstream raw materials to produce the polysilicon wafers and cells. However. Most of those raw materials are exported to companies in foreign countries. Once the Chinese domestic industry matures, those supplies could be used for domestic purposes, thus elevating the competitive advantages it has in the global market.

Moreover, China's government policies supporting renewables have been meaningful in recent years, but far less stable over time than government support for fossil fuels. From the perspective of consumer energy security, distributed generation and variable renewable energy technologies should be effectively deployed to protect households and industries against the risk of costly voltage fluctuations and power outages, and are especially well-suited for off-grid remote applications in rural areas where consumption is low and the distance to the nearest distribution center is high.[87] In order to promote the long-term security of energy producing resources in diverse ways, each source of energy should be protected and directed by laws and regulations specifically conducive to the future growth of that resource.

China is now working on a **deepened supply-side structural reform** in its electricity sector, including deleveraging electric power companies and eliminating excess capacity of coal mining and coal-based power, upgrading and improving the utilization efficiency of power equipment, restructuring and downsizing glutted industries, rooting out backward production capacity, fixing the mismatch in resource allocation and the imbalance between electricity supply and demand, as well as reducing all types of business burdens and channeling more energy into weak areas of the electricity market.

---

[86] See original governmental resource in Chinese: *政府信息公开目录---国家能源局---国家发展改革委 国家能源局关于建立健全可再生能源电力消纳保障机制的通知*. (n.d.). Retrieved December 14, 2019, from http://zfxxgk.nea.gov.cn/auto87/201905/t20190515_3662.htm; See China's 2018-2020 clean energy consumption plan: http://www.ndrc.gov.cn/zcfb/gfxwj/201812/t20181204_922172.html.

[87] Kessides, I. N. (2012). The Impacts of Electricity Sector Reforms in Developing Countries. Electricity Journal, 25(6), 79–88, at pp. 87.

ECONOMIC – economic planning agency vs. environment regulatory agency

As a centralized developing country, economic interests are deeply embedded into the country's climate policy framework. Climate change impacts are understood primarily in macroeconomic terms[88], and the general principles of environmental interests and private energy rights are absent. In May 2013, Chinese President Xi Jinping made a statement that environment should not be sacrificed for temporary economic growth[89]. It is for the first time, that there is clear signal from the political leadership about the value of environment, and which would not hold second rank to the economy in China's development.

Moreover, as a planned economy, China has enacted numerous environmental laws, rules and standards, as well as a variety of environment-related laws and state ideologies. However, when it comes to addressing specific environmental issues, assigning responsibilities for meeting the emissions reduction targets, and introducing substantive measures as guidelines, especially in dealing with matters of implementation, the central government planning plays the dominant role in environmental governance.

Planning in China is a complex process involving many players. The goals, target, and allocations for responsibilities and resources resulting in the adoption of FYPs may reflect the personal views and personal ties of powerful leaders, the preferences of major interest companies, influential theories about economic development, assessments of what is needed to maintain the stability of the system, the ideas of remarkable scientists, responses to rising public pressures, and so on forth[90]. The reluctance of the leaders to allow the public to share in this decision-making process is one contributing factor to the administrative monopoly of China's central government agencies.

That is why, the NDRC, as China's top economic-planning agency, stands as the single most important climate governance agency in China, whereas the former Ministry of Environmental Protection (MEP), although shares the same rank with the NDRC under the State Council, stands only as an environmental protection department, charged with the mission of "to improve environmental quality and build a beautiful China which enjoys blue sky, green land and clean water[91]". It is worth noting that the NDRC has its own energy and environment departments – the National Energy Administration (NEA), Department of Climate Change, Department of Resource Conservation and Environmental Protection, as the NDRC's subsidiaries. It is often the case, that the environment regulatory agencies (for example, the

88 Sautter, J. A. (2009). The Clean Development Mechanism in China: Assessing the Tension Between Development and Curbing Anthropogenic Climate Change. Va. Envtl. LJ. Retrieved from https://heinonline.org/hol-cgi-bin/get_pdf.cgi?handle=hein.journals/velj27&section=6.

89 Original resource in Chinese: *[书摘]《习近平重要论述学习笔记》：决不以牺牲环境为代价去换取一时的经济增长 -新华时政-新华网.* (n.d.). Retrieved December 14, 2019, from http://news.xinhuanet.com/book/2014-05/30/c_126566334.htm.

90 Young, O. R., Guttman, D., Qi, Y., Bachus, K., Belis, D., Cheng, H., … Zhu, X. (2015). Institutionalized governance processes: Comparing environmental problem solving in China and the United States. Global Environmental Change: Human and Policy Dimensions, 31, 163–173.

91 Governmental resource in Chinese, retrieved from http://english.sepa.gov.cn/About_SEPA/Mission/.

former MEP) are weak relative to other economic planning agencies (the NDRC) in political terms[92].

Together with the NDRC, the Ministry of Finance and the People's bank of China stand as the top "three carriages" for China's economic development and are frequently involved in China's environmental governance decision-making process.

Thus, the environment regulatory system in China is viewed as a very comprehensive regime with economic planning as the most important content. It is necessary to reduce the economic nature of China's climate change policy. In addition, various planners in the energy sector still need to coordinate on where the most demand is. However, knowledge beyond economics is also important. For example, the integration of China's environmental program evaluation system might require new administrative departments to be set up. Further discussions about key authorities over climate and energy issues will be provided in part three and part four of this chapter, so that we can lay out the institutional foundation for environmental governance in China.

STATE AND LOCAL – the vertical dimension of China's climate governance

In the introduction chapter, this work discussed that China's climate governance processes often rely on the launching of pilot programs in selected regions, learning from these experiments, and scaling up successful experiences for broader application[93]; that the low carbon development and market-oriented reform has been accompanied by these environmental pilots. Here, it is important to mention that unlike the United States, China has a more state-based regulatory system. Local pilot programs are mostly under the control of the central government, and local governments do not have the authority to make their own decisions. Provinces and cities may compete to become pilots, and their governments can choose whether or not to be proactive in this competing process, but the central government decides on the designation of location of pilots, takes the lead in evaluating the results, and controls what to adopt nationwide. Therefore, it is important to understand the general structure of China's government agencies both in the central and local level, so that we can better understand how these local environmental pilot projects run under this regime.

China's climate governance is departmental-regional fragmented. The departmental dimension contains each ministry in the central government and the same functional agency branches in local government layers. The regional dimension spreads from central government to jurisdictional-based local or provincial governments[94]. Under the centralized Chinese political system, in both dimensions, there are power delegations from the center to localities, for example, from the NDRC to its local counterparts (provincial Development and Reform Commissions), from the MIIT to the provincial offices of the Economic and Information Commission,

---

[92] For example, the NDRC is a co-chair of the National Clean Development Mechanism (CDM) Board of China, whereas the former MEP is only a board member.

[93] Schreurs, M. A. (2008). From the Bottom Up: Local and Subnational Climate Change Politics. Journal of Environment & Development, 17(4), 343–355.

[94] Jin, Y., Andersson, H., & Zhang, S., no. 32 above.

and so forth (see Table. 1.1). Sub-national agencies and governments are expected to implement policies determined centrally[95] and "administratively subcontracted[96]" to local governments. The central government sets targets for provincial governments, which in turn set targets for lower level local governments[97]. However, some sub-national agencies are under direct supervision of local governments, while other sub-national agencies are directly oversight by its higher-level competent authorities under the central government.

National	Sub-national
State Administration of Taxation	Provincial offices of the State Administration of Taxation
Ministry of Finance	Local Bureau of Finance
Ministry of Housing and Urban Rural Development	Local Commission of Housing and Urban Rural Development
Department of Price of the NDRC	Local Price Bureau
The Ministry of Industry and Information Technology	Provincial offices of the Economic and Information Commission
The National Development and Reform Commission	Provincial Development and Reform Commissions
National Energy Administration	Regional Energy Regulatory Bureaus Provincial Energy Regulatory Office
Former Ministry of Environmental Protection (merged into the Ministry of Ecology and Environment in 2018)	Regional (Environmental Protection) Inspection Bureaus Regional Office of Nuclear and Radiation Safety Inspection Local Environmental Protection Bureaus
State Administration of Taxation	Provincial Offices of the State Administration of Taxation

Table 1.1

Under this multi-tiered structure, central design may be followed by local implementation including creative competition, but also by local resistance in different forms[98].

On one hand, local pilot programs can be a step stone towards a new national policy, which open up space for innovation and experimentation in using local environmental experiments as demonstrations for future larger-scale environmental programs. In today's China, central government agencies, while sitting at the pinnacle of authority, are relatively small as measured by the size of the civil service, and do not possess the requisite information required to make sound management

[95] Schreurs, M. (2017). Multi-level climate governance in China. Environmental Policy and Governance, 27(2), 163–174.
[96] Zhou, L. (2014). Administrative subcontract. Chinese Journal of Sociology, 6, 1–38.
[97] Young, O. R., Guttman, D., Qi, Y., Bachus, K., Belis, D., Cheng, H., … Zhu, X., no. 90 above.
[98] Ibid.

decisions. Questionable technical capabilities and know-how are major concerns for an effective regulation of the industry; one example is the NDRC and its pilot carbon market experiments - since this was the first time that the NDRC design and run an actual market in the real world outside Beijing. Without detailed information generated at the local level, national policies are generally too broad and impractical, and agencies may not be familiar with the certain industry or entity they regulate. A special kind of government letter - "requests for comments" is widely used under these occasions, however, most of the times, local governments, local environmental and energy authorities are given less than two months (occasionally even less than two weeks) to draw up plans, come up with comments, and submit them to Beijing. This stood as a clear limitation of China's extremely centralized and socialist planned economy for decades looking back on the years when China remained a close society to the outside world. Starting 1978, under Deng Xiaoping, China's paramount leader from 1978 to 1992, China began a socialist market economic reform in specific regions. Special economic zones were created, where new ideas could be tried out before being introduced in the entirety of society, which led to decentralization and socialist modernization in many sectors in China. Since then, local experimentation became an important measure for China's central government which allows lessons to be learned before new policies being scaled up nationally. With the local governments given more and more leeway to determine how to spend resources to fulfill those policies, there is reason to believe that in the future, more attention will be paid to local testing grounds for testing out new ideas, regional experiments, demonstration projects and policies.

On the other hand, the question of local regulatory agencies is also a question of policy implementation. As mentioned above, one major obstacle for China's climate governance is weak capacity of the central government and government agencies at the national level; however, another obstacle is the lack of oversight of programs and resource allocations at the local and provincial levels. A successful policy implementation in all political systems requires strong leadership support as well as good coordination between local government agencies and administrative branches. A variety of competing forces such as personal ambition and the effects of corruption can impede, reshape or even block progress of meeting the central government's pollution control and climate change goals by the plans[99]. In China, information is regarded as power, and a lot of times, especially when there are overlapping programs or agency missions, the local governments and individuals are reluctant to share data and knowledge. Many local officials believe that these political dynamics would reserve government agencies more discretion. However, this may encourage wasteful bureaucracy and significant political gridlock. Taking the experimental carbon trading pilots as an example, local governments and many large companies are risk averse; this is due partly to their culture, but mainly to not having enough information about costs and realistic revenues. Therefore, these parties might be defensive regarding the immature carbon markets; this, in turn, would weaken the government's ability to provide incentives and to enforce the relevant legislation. The

[99] Young, O. R., Guttman, D., Qi, Y., Bachus, K., Belis, D., Cheng, H., … Zhu, X., no. 90 above.

central government is searching for means to strengthen implementation performance and to energize stronger local environment and climate actions.[100]

Literature looking at the institutional logic of driving factors motivating local response to central government calls and affecting local government actions has made important progress.[101] This work does not go deep into this line of literature but borrow some of their shared conclusions to try to explain the most important reasons, expressed as:

1. Motivation:

Local economic development and government revenue (taxes, fees, and dividends from State-owned Enterprises) as well as career promotion opportunities of key government officials (top leaders in the local government) is a major motivating factor. Some visionary local government, largely driven by the promotion mechanisms, are seizing the political opportunity for leadership, managing to spread their policies nationwide and to distinguish themselves for being innovative by taking proactive actions on important issues.

2. Central government mandate:

Upper-level governments are important sources of power over local governments. The power that a local government possesses determines what and how much it can do, that is, authority and discretion in dealing with specific issues. However, when strong political pressure from the upper-level governments is perceived by local governments, the latter may even "over implement".

3. Capacity and awareness:

Without concerted efforts, lack of awareness and low technical capacity is often a limiting factor of local (particularly prefectural) governments in dealing with climate change issues, which are often factors behind slow governmental reactions.

4. Market signals:

Market and financial incentives are often strong and effective means to influence local government behavior. The entrepreneurial nature of local governments in China often leads to tradeoffs in order to "not make it too hard for the industry they regulate". In China's political context, "win-win" is always a more favored planning theme. In some cases, local governments are even described as companies' nannies in climate governance under the market-oriented mechanism.[102]

5. Constraints and power sources:

In China's top-down accountability structure, lower levels of government are held accountable by upper levels but not their constituencies. This often makes constraints on local governments less stringent. In the current relationship between the center and localities, rules of limits for behavior and penalties for noncompliance are often not explicitly defined and delineated.

6. Internalized needs:

---

[100] Ma, J. (2016). The Economics of Air Pollution in China: Achieving Better and Cleaner Growth. Columbia University Press.

[101] Qi, Y., Ma, L., Zhang, H., & Li, H. (2008). Translating a Global Issue Into Local Priority: China's Local Government Response to Climate Change. Journal of Environment & Development, 17(4), 379–400.

[102] Original resource in Chinese: *发改委晒成绩单 电改"九龙治水"待解*, retrieved from: http://energy.people.com.cn/n1/2016/0510/c71661-28337666.html.

Local needs of economic growth remain priorities for local governments. However, due to the intrinsic link to energy use, actions such as energy saving, pollution reduction, as well as energy efficiency and renewable energy development are now internalized as local needs.

Some policy implications may be identified from these conclusions, more to be discussed in the following chapters. China's national-provincial structure has created frequent conflicts and obstacles for local governments to implement national policies. If climate change is to be addressed effectively and in the near future, then it is recommended that government should provide more motivations for a bottom-up innovation instead of a top-down power delegation and should energize a properly functioning market in order to strengthen policies' implementation performance.

POLITICS

According to China's state constitution, the State Council (SC), also known as China's Central People's Government, is the "highest organ of State administration". It is responsible for implementing policies formulated by the Communist Party and laws passed by the National People's Congress (NPC), and for overseeing the day-to-day work of the State bureaucracy[103] dealing with such affairs as China's internal politics, diplomacy, national defense, finance, economy, culture, education, and environment. The SC is headed by a Premier, who serves as the Communist Party's No.2-ranked official. The Premier is assisted by four Vice Premiers, five State Councilors and one Secretary General, all full members of the dominant political institution - the Central Committee of the Communist Party of China (CPC).

Thus, the political institutions in China do not play a separate role in both general climate governance and detailed energy regulation. Theories particular to power politics are relevant to our discussion on China's climate governance. However, a comprehensive and in-depth application of these theories and analysis of China's climate governance authorities and energy regulatory agencies deserve a separate dissertation, but these theories can shed light on politics and regulations concerning the energy industry. For example, there have been years of intense discussions on whether China should give priority to develop distributed solar PV systems or centralized solar PV power stations, on whether China should adopt a feed-in-tariff (FIT) or government subsidies for stimulating renewable energy development. However, such discussions vanish abruptly every time when there is one clear signal from Party leaders or some documents of the Central Party Committee. Moreover, although China is relatively stable from being impact by a government change from the switch of the dominant Party, market operation is still being impact by short-term political objectives and preferences of the legislators. China's regulatory authorities over climate and energy issues are not independent from the government policymakers. Under China's current incomplete market-based reform, the chosen aims of policy are the key factors, rather than the market itself.

[103] Lawrence, S. V. (2013). China's Political Institutions and Leaders in Charts. Retrieved from https://china.usc.edu/sites/default/files/legacy/AppImages/crs-2013-china-political-leaders-institutions.pdf.

As a result, China's environment and energy regulations and policies can be very unpredictable for project developers - market players, SOEs, even local government officials mired in some bureaucratic tussles. It is important to understand the trends and driving factors for China's policy changes and the institutional logic of governance phenomena from history to present.

III. Part Three: General government structure - key authorities over climate and energy issues, former state-owned power producers, and institutes

There are administrative agencies that are mostly being challenged to address some externality and risk issues associated with energy resources, and there are those that focus heavily on promoting stability in economic aspects of energy resources. For purposes of organizing the discussion, the former is referred to as "climate governance agencies" and the latter as "energy regulatory agencies". Given energy's role in the economy and direct impact on climate governance, this work focuses only on environmental programs that are closely tied to the energy industry.

From the previous part, we learnt that China's political institutions and government agencies share the same body, and administrative regulations are not separated from political affairs. This work now turns to general structure of government and markets and key government institutions related to energy and climate issues.

The Communist Party generally conducts its governance through the SC and a wide array of organizations and administrative offices under it. They include cabinet-level departments such as the NDRC, the former MEP, and the MIIT, and such organizations as the State-owned Assets Supervision and Administrative Commission (SASAC[104]). They also include administrative offices such as the Legislative Affairs Office of the SC, and institutions for banking, securities, insurance, and others. It is worth noting that the former State Electricity Regulatory Commission (SERC), responsible for administration and regulation of the electricity and power industry, was once one of these institutions directly under the SC, but it was later folded into the National Energy Administration (NEA), under supervision of the NDRC.

GENERAL CLIMATE GOVERNANCE AGENCIES

Unlike the United States, in China there are no independent regulatory agencies like the Environmental Protection Agency (EPA) that administers a wide array of policies and environmental programs that affect emissions from the energy industry[105], that is, as authorized by top legislative branch, agency which encompasses the entire energy industry on emissions issues. The climate governance system in China is viewed as a very comprehensive regime. For example, although it might appear that the National Audit Office (NAO) of China and its department of resources and environment are playing an important role in China's environmental audit system, it has never been an important player in China's climate governance. As

[104] The SASAC is considered as **special** organization directly under the SC, whereas entities such as State Administration of Taxation stand as regular organization directly under the SC.

[105] Eisen, J. B., teacher), E. H. (law, Rossi, J., Spence, D. B., Weaver, J. L., & Wiseman, H. J. (2015). Energy, Economics, and the Environment: Cases and Materials. Foundation Press.

for a lot of times, the NAO's environmental auditing functions, such as the Clean Production Audit, the performance audit of public investment funds on energy projects, as well as the post-term environmental audit for senior officials had been partly or entirely taken over by the NDRC, the NEA, and the newly established Ministry of Ecology and Environment (MEE, the former MEP). Also, there is no national plan at the moment to strengthen or unify China's environmental audit systems.[106] Thus, understanding China's climate governance necessitates a survey of all the administrative and regulatory agencies involved, and how this multi-level political structure is being used in climate governance[107].

Aside from the NDRC and the MEE, this work will also focus on another independent agency under the State Congress - the Ministry of Industry and Information Technology (MIIT), because of its special and direct relationship to the industry. There has been little research on the MIIT and China's climate governance, however, the MIIT's regulatory experience and history is closely involved and tied to the country's energy consumption of the industrial sector and China's energy conservation policy, unlike the other government agencies. The MIIT, thus, plays an important role in China's energy conservation governance. This section will focus on: a) the National Development and Reform Commission (NDRC), lead agency of China's low carbon economy target, which oversights the country's emissions reduction and resource conservation issues, and; b) MEE, the former Ministry of Environmental Protection (MEP) which is subject to environmental pollution control management, and; c) the Ministry of Industry and Information (MIIT) which exercises management of energy consumption of the country's industrial sector and has responsibility of promoting China's energy conservation issues.

1. NDRC:

The NDRC is a macroeconomic management agency under the State Council (representing the central government), which studies and formulates policies for economic and social development, maintains a balance of economic aggregates and guides the overall economic system restructuring. Rather than a regulatory agency, the NDRC serves as a coordination mechanism for macro affairs. It is generally regarded as the most powerful civilian agency in the central government and plays a key role in assembling and drafting the FYPs and making policy recommendations – known as China's economic policy factory or the "mini State Council".

The FYPs set forth overall goals, establish priorities (address the allocation of resources among targets where tradeoffs among goals are necessary), and spell out numerous targets in a five-year cycle, with environmental goals increasingly joining economic goals, such as pollution reduction targets, renewable energy targets, and energy and carbon intensity reduction targets[108]. The plans also introduce innovations in procedures used to promote effective implementation and provide

[106] Chinese environmental audit systems for the government, CCICED Special Policy Study Report, retrieved from http://english.mee.gov.cn/Events/Special_Topics/AGM_1/AGM2014/download/20160524201834962185.pdf, at pp. 4.

[107] Schreurs, M., no. 95 above.

[108] Key targets of China's 12th five-year plan - China.org.cn. (n.d.). Retrieved December 14, 2019, from http://www.china.org.cn/china/NPC_CPPCC_2011/2011-03/05/content_22059883.htm.

criteria for evaluating the performance of governance. China is now in its 13th FYP period. The National People's Congress and the State Committee adopt the plans formally. While the FYPs do not take the form of laws, they are backed by the CPC Central Committee and the authority (formal institutions) of the government. In principle, a plan must be consistent with the laws. However, in real practice, conflicts are not uncommon, reflecting that the laws are absent and are sometimes marginalized in order to fulfill the central government's wills. In the process of drafting the plan, the NDRC consults with other agencies and other levels of government.

Understanding the nature and function of China's current government agencies is best understood within a historical context, as agencies' past administrative and regulatory experience will be transferred together with the institutional restructuring and power relocating process. In 1952, the State Planning Commission (SPC) was created, and was renamed as the State Development Planning Commission (SDPC) in 1998. For decades, it has been served as the country's macroeconomic management agency, which had broad administrative and planning control over the Chinese economy. It was one of the country's top two important agencies over economy. The other one was the State Economic and Trade Commission (SETC), which was abolished in 2003. The functions of the abolished SETC were taken over by the SDPC (transformed into the NDRC in 2003), the State-owned Assets Supervision and Administration Commission of the State Council (SASAC), and the Ministry of Commerce (MOCOM). In 2008, the industrial management function of the NDRC was reallocated to the MIIT. At the same time, the National Energy Administration (NEA, formerly the National Energy Bureau) was established, oversight by the NDRC. In 2013, the State Electricity Regulatory Commission (SERC) was abolished and taken over by the NEA. The comprehensive and in-depth discussion of the NEA and its relationship with the NDRC deserves a separate section, which will be discussed in the following section. Today, the NDRC has 33 functioning departments, bureaus and offices[109]. Subsidiaries of the NDRC that are relevant to our discussion are encapsulated in the illustration below[110]:

General Office is in charge of day-to-day operation of the Commission, including but not limited to "processing documentations and telegrams, organizing meetings, confidential information communication, keeping files, etc. It is also responsible for information acquisition, confidentiality management, handling of complaint letters and visits, and government information disclosure, as well as the Commission's budget and finance, assets management, and internal auditing, etc.[111]"

Department of Industry - it is responsible for issues concerning the development of industry and service industry and coordinating with relevant agencies, plans and programs.

---

[109] It is important to note that some of these departments, bureaus and offices have been merged into the (newly established) Ministry of Ecology and Environment and the (also newly established) Ministry of Natural Resources in 2018.

[110] National Development and Reform Commission (NDRC) People's Republic of China 1. (n.d.). Retrieved December 14, 2019, from http://en.ndrc.gov.cn/.

[111] Governmental resource, retrieved from: http://en.ndrc.gov.cn/mfod/200812/t20081217_252116.html.

Department of Resource Conservation and Environmental Protection is responsible for issues related with the coordinated development of economy, society, environment and resource; the conservation and comprehensive utilization of energy and resources; the development of circular economy; the environmental protection industry and clean production; and organizing key pilot programs of energy conservation and emission reduction. Together with the department of industry, it came up with the **Energy Use Trading Scheme**. It also undertakes the daily work regarding the energy conservation and emission reduction issues assigned by the National Leading Group dealing with Climate Change, Energy Conservation and Emission Reduction (NLGCCECER), which is a deliberation and coordination agency of the State Council with interim administrative power. It was created in 2007, led by the premier, with 27 agencies in the group, representing almost all agencies of the central government and its decision-making capacity on climate change. The National Leading Group dealing with Climate Change (NLGCC) and the National Leading Group dealing with Energy Conservation and Emission Reduction (NLGECER) are same group of agencies and officials but work under two different titles on foreign affairs. This kind of institution set up is called "one body, two names[112]", which is not uncommon in China.

Department of Climate Change (merged into the MEE in 2018), is responsible for analyzing impact of climate change on social-economic development and organizing the formulations of key strategies, plans and policies dealing with climate change, and coordinating with relevant agencies, plans and programs. It is taking the lead in the implementation of the United Nations Framework of the Climate Change Convention (UNFCCC), and issues regarding international cooperation and negotiation on climate change. It is responsible for organizing and implementing the work relating to clean development mechanism (CDM). It also undertakes the daily work regarding the climate change issues assigned by the National Leading Group Dealing with Climate Change, Energy Conservation and Emission Reduction. It is taking the lead of China's national **Emissions Trading Scheme** (ETS). In March 2018, the 13th NPC approved the SC's institutional reform proposal[113], in which the NDRC's duties of responding to climate changes and reducing emissions were consolidated to the newly established MEE.

The National Energy Administration (NEA) – it is China's top energy regulatory authority. It came up with the **Green Power Trading Scheme** and is taking the lead of China's **electricity system reform** - to be discussed in the next section.

Department of Policy Studies is "responsible for drafting important documents; organizing studies on key issues concerning economic and social development, reform and opening-up, and international economy.[114]" It is also in charge of news release, information guidance, expectation management, and public opinion

---

112 *一个机构，两块牌子*

113 Decision of the First Session of the Thirteenth National People's Congress on the State Council Institutional Reform Proposal. (n.d.). Retrieved December 14, 2019, from http://en.pkulaw.cn/display.aspx?id=4b2ccf8d03cc24fabdfb&lib=law&SearchKeyword=&SearchCKeyword=%bb%fa%b9%b9%b8%c4%b8%ef.

114 Governmental resource, retrieved from: http://en.ndrc.gov.cn/mfod/200812/t20081217_252117.html.

information monitoring and analysis.

Department of Development Planning – it is responsible for recommending strategies for national economic and social development and productivity allocation; putting forward objectives and policies and organizing the formulation of medium and long-term national economic and social development plans; as well as plan implementation monitoring and evaluation, coordinating major plans and regional plans, and economic aggregates balance and structural readjustment.

Department of National Economy is responsible for monitoring and analyzing domestic economic situation and international economic dynamics, providing macro-economic forecast early warning, identifying macro-economic regulation objectives and recommendations on the exercise of various economic tools and policies, as well as carrying out micro-economic regulation policies evaluation; drafting and putting forward annual plans for national economic, social development, and annual aggregate targets and policies to balance the supply and demand of key commodities.

Bureau of Economic Operations Adjustment is responsible for major problems occurred in economic operation, organizing the emergent dispatching of coal, electricity, oil, gas and other important materials and coordinating their transportation.

Department of Economic System Reform (former Economic System Reform office of the State Council) – it is responsible for carrying out studies on important issues concerning economic system reform and opening up, guiding the progress of pilot projects and demonstrative zones of economic system reform.

Department of Trade – it is responsible for monitoring and analyzing both domestic and international markets.

Department of Laws and Regulations is responsible for drafting laws, regulations and rules, carrying out validity auditing of relevant regulatory documents, handling administrative reconsideration responding to administrative lawsuits, guiding and coordinating tendering according to relevant rules.

Department of Price, former Price Bureau, is responsible for forecasting price changes and moderating the fee-charging policies and regulations, as well as prices of key commodities, including electricity. It is also responsible for organizing cost investigation concerning major products, commodities and services.

Bureau of Price Supervision and Anti-Monopoly is responsible for drafting administrative laws and regulations guiding and regulating price supervision and inspection, handing price monopoly activities, organizing activities related to commodity price, service price and fee collection involving violation of price-related laws by central government agencies, as well as handling reconsideration cases and appeals concerning the punishment of price violations.

Department of Fixed Asset Investment is responsible for monitoring and analyzing all fixed asset investment activities, putting forward recommendations on deepening investment structure reform and revising the catalogue of fixed asset investment projects subject to verification, arranging central budgetary construction fund, examining and approving major construction projects.

Department of Basic Industries is responsible for coordinating the energy and transportation development plans, analyzing the performance of energy industry and transportation industry.

Office of Key Project Inspectors[115] is newly established in early 2019, "responsible for inspecting and monitoring implementation of national key construction projects; tracking and inspecting the implementation of national investment policies and regulations in relevant industries and by local authorities; inspecting and monitoring the implementation of national budgetary investment; making recommendations on the breach of national regulations.[116]"

It is not hard to see that China's Energy Use Trading Scheme[117], Emissions Trading Scheme, Green Power Trading Scheme, as well as the electricity system reform, are all brought up and led by different departments, bureaus, administrations or offices of the NDRC, which could lead to problematic implementation performance even within one government agency[118].

2. MEE:

The newly established Ministry of Ecology and Environment is China's top agency tackling climate change. It has consolidated the duties of the former Ministry of Environmental Protection (MEP) and some climate governance functions of the NDRC, the former Ministry of Land and Resources, the Ministry of Water Resources (MWR), the Ministry of Agriculture and Rural Affairs (MOA), the State Oceanic Administration, and the Office of the South-to-North Water Diversion Project Construction Committee.[119] The MEE also takes charge of China's various climate-related campaign programs and the environmental impact assessments (EIA) system – to be discussed in Chapter 4 in this dissertation. Internal departments of MEE include but not limited to the department of general affairs (different from the general office), the department of laws, regulations, and standards, the department of climate change[120], the department of environmental impact assessment and emission management, the department of ecological and environmental monitoring, and the bureau of ecological and environmental enforcement. The establishment of MEE has shown China's efforts to integrate its government functions to optimize its climate governance system.

3. MIIT:

Established in March 2008, the Ministry of Industry and Information Technology is a state agency under the central government of China responsible for regulation and development of the postal service, internet, wireless broadcasting, communications, production of electronic and information goods, software industry

---

[115] *评估督导司*

[116] Governmental resource, retrieved from: http://en.ndrc.gov.cn/mfod/200812/t20081218_252219.html.

[117] In 2019, the NDRC proposed a national public resources trading platform which would include trading of carbon emissions quota, pollution emissions quota, energy use right, and other public resources.

[118] The newly established Ministry of Ecology and Environment started to take charge of the national ETS in 2019.

[119] See Article 2 of the Decision of the First Session of the Thirteenth National People's Congress on the State Council Institutional Reform Proposal. (n.d.). Retrieved December 14, 2019, from http://en.pkulaw.cn/display.aspx?id=4b2ccf8d03cc24fabdfb&lib=law&SearchKeyword=&SearchCKeyword=%bb%fa%b9%b9%b8%c4%b8%ef.

[120] NDRC's former internal department of climate change

and the promotion of the national knowledge economy. More importantly, the MIIT stands as China's industrial regulatory department, in charge of program planning, policy making, standard formulating, supervising day-to-day work and directing the development of almost all of China's industrial sectors. It also has authorities over the development of major technology equipment and self-innovation.

One important subsidiary of the MIIT is department of energy conservation and integrated utilization. It oversees energy consumption of all industrial sectors. The MIIT is very much involved in China's energy regulation regarding energy conservation, cleaner production, electricity system reform, carbon credits, clean energy resources, and New Energy Vehicles (NEV). Two good examples here would be China's energy efficiency "Leader" system[121] and China's hydrogen vehicle industry.

4. Other general climate governance agencies in China:

Include but not limited to the Ministry of Housing and Urban-Rural Development (MOHURD), the Ministry of Water Resources (MWR), and the National Forestry and Grassland Administration. According to government resources, these agencies, together with the NDRC and the MEE, "shall take the lead and be responsible according to the division of labor based on duties"[122] facing issues regarding ecological and environmental protection.

ENERGY REGULATORY AGENCIES

This work now goes into components of various energy projects and the most relevant regulatory authorities, as well as government agencies generally in charge of the energy industry.

First, ownership and control of land and resources is regulated by the Ministry of Natural Resources (MNR). It was formed in March 2018, incorporating the functions of the former Ministry of Land and Resources, the former State Oceanic Administration, the former State Bureau of Surveying and Mapping, and the former State Forestry Administration, with additional responsibilities coming from the NDRC, the Ministry of Housing and Urban-Rural Development (MOHURD), the Ministry of Water Resources (MWR), and the Ministry of Agriculture and Rural Affairs (MOA) [123].

Second, method of extraction or capture is regulated by the SASAC, which oversees all national-level state-owned enterprises, including the China National Petroleum Corporation, the China Petrochemical Corporation, and China National Offshore Oil Corporation.

Third, implications on building the power plant and infrastructure are regulated by the NEA, administrated by the NDRC. The NEA takes on responsibilities of managing matters and policy research related to energy, including coal, oil, natural

---

[121] Plan of implementation for a energy efficiency "Leader" system https://chinaenergyportal.org/en/plan-of-implementation-for-a-energy-efficiency-leader-system/

[122] http://en.pkulaw.cn/display.aspx?id=900647650fa99086bdfb&lib=law&SearchKeyword=&SearchCKeyword=%bb%f9%b4%a1%c9%e8%ca%a9

[123] The newly established State Forestry and Grassland Administration takes on the responsibilities of the former State Forestry Administration and grassland regulatory responsibility of the MOA. It is now regulated under the MNR.

gas, and the electric power industry, with six regional energy regulatory bureaus and 12 provincial-level energy regulatory offices. Over years, there have been recurring proposals for elevating and expanding NEA's existing authority over energy issues and creating a cabinet-level energy ministry[124], as NEA lacks power to carry out many of its assigned tasks because responsibility for the energy sector is currently spread among a number of government authorities and departments[125].

This list is by no means a complete description of regulatory agencies that affect the energy industry and environmental programs. For example, the Ministry of Finance plays a role in formulating and implementing strategies, policies, standards and guidelines for public finance, and MOHURD is involved in the solar PV poverty alleviation pilot projects and China's rural electrification.

OTHER GOVERNMENT ORGANIZED BODIES

1. Deliberation and Coordination Organs under the State Council (SC):

They are policy coordination and consultation bodies which report to the SC. Upon the consent of the SC, they shall stipulate interim administrative measures under special or urgent circumstances. Energy-related SC deliberation and coordination organs include the National Energy Commission (NEC), the SC Leading Group of Poverty Alleviation and Development (CPAD)[126], the National Leading Group Office for Climate Change, the National Leading Group for Promoting the Construction of "Belt and Road", and the SC Coordination Group for Advancing the Function Transformation[127].

Here, it is worth mentioning that as a consequence of the hybrid energy regulatory model, current committee members of these energy-related SC deliberation and coordination organs – SEC, for instance, include directors/deputy directors/general secretary of the SC, the General Office of the SC, the Central Financial and Economic Affairs Commission[128], the Ministry of Foreign Affairs, the NDRC, the Ministry of Science and Technology, the MIIT, the Ministry of State Security, the Ministry of Finance, the MNR, the MEE, the MOHURD, the Ministry of Transport, the MWR, the MOA, the Ministry of Commerce (MOCOM), the Ministry of Emergency Management, the People's Bank of China, the SASAC, the State Administration of Taxation, the China Banking and Insurance Regulatory Commission, the Logistical Support Department of Central Military Commission, and the NEA. This a good example of the multi-department structure of China's energy regulatory system.

---

[124] *王康鹏*. (2008). *如果成立能源部——"能源部"现身？中国石油石化*, (5), 18–21.; China Plans New Energy Ministry to Replace the National Energy Administration | Environment, Land & Resources. (2018, March 16). Retrieved October 10, 2019, from Environment, Land & Resources website: https://www.globalelr.com/2018/03/china-plans-new-energy-ministry-to-replace-the-national-energy-administration/; *中国工程院院士刘中民：能源"九龙治水"局面亟待改变_中国碳排放交易网*. (n.d.). Retrieved October 10, 2019, from http://www.tanpaifang.com/tanguwen/2019/0823/65273.html.

[125] Wen heads "super ministry" for energy. (n.d.). Retrieved October 10, 2019, from http://www.chinadaily.com.cn/china/2010-01/28/content_9388039.htm.

[126] See Chapter 4 for details.

[127] Its functions include coordinating issues regarding the reform of the investment approval system.

[128] The Commission is considered the highest body for coordination and discussion on issues related to the economy, which continues to control the country's economic lifeline.

2. State-owned enterprises (both before and after the mixed-ownership reform):

Including but not limited to the China National Petroleum Corporation, China Petrochemical Corporation, China National Offshore Oil Corporation, State Grid Corporation of China, China Southern Power Grid, China Huaneng Group, China Datang Corporation, China Huadian Corporation, China Power Investment Corporation, China Three Gorges Corporation, China Energy Investment Corporation, China National Nuclear Corporation, China Energy Conservation and Environmental Protection Group, and State Development & Investment Corporation. Many of these SOEs frequently participate in making China's major energy decisions through expert consultation, feasibility study, and major government project design.

Since 2016, China has selected nearly 300 SOEs in four batches to conduct the pilot mixed-ownership reform. During these mixed-ownership pilots' development, some of these SOEs brought in foreign and private investors and management teams, while others merged into even bigger monopolies. However, incomplete market-oriented reforms of China's energy industry are likely to translate into large economic profits for a small number of firms that dominant the energy sector, which would be a dangerous consequence of reform without sufficient privatization.[129]

3. Institutes

A list of dominating (government organized) institutes to study energy issues includes but not limited to the Energy Expert Advisory Committee of the NEC (administrated by the NEA), China General Certification Center (COC), Chinese Wind Energy Association (CWEA), Chinese Renewable Energy Society (CRES), China Urban Construction Design & Research Institute, China Renewable Energy Engineering Institute (CREEI), Electric Power Planning & Engineering Institute (EPPEI), China National Renewable Energy Centre (CNREC), China Energy Law Institute of China Law Society, China Energy Research Society (CERS), China Electric Power Planning and Engineering Institute, China International Engineering Consulting Corporation (CIECC, administrated by the SASAC), and NDRC Energy Research Institute. It also includes Provincial Energy Planning and Research Centers, various Chinese universities, and institutes affiliated to SOEs, for example, the State Grid Energy Research Institute, the China Petroleum Planning and Engineering Institute of PetroChina Company Limited, and the Electric Power Construction Techno-economic Consultation Center of China Electricity Council.

THIRD-PARTY EVALUATION AGENCIES

The Third-party Evaluation Agencies hardly play a role in China's climate governance and energy regulation. There are several reasons for this, some of them unique to the Chinese situation.[130]

First, the history of China's planning economy has led to a strong connection and mutual trust between energy regulatory authorities and SOEs. In most cases, experts

[129] Kessides, I. N. (2012). The Impacts of Electricity Sector Reforms in Developing Countries. *Electricity Journal*, *25*(6), 79–88.

[130] For details see Chapter 4.

from these energy regulatory authorities and SOEs would undertake a large proportion of evaluation work through *directional authorization* due to their years of "teamwork" relationship, especially in the energy field. It is also very hard for third-party evaluation agencies to win *public bidding* because their lack of experience, resource, qualified personnel, and data.

Second, with SOEs and their dominant market share in China's energy industry, interests of these energy monopolies are generally considered equivalent to China's national interests. Both centrally administrated and SOEs managed by the local authorities represent governments' power-will of different levels.

Last, evaluations from SOEs are considered internal evaluations[131] and are therefore easier to be accepted and utilized. There were cases that China's energy regulatory authorities entrusted international third-party consulting firm to evaluate China's major energy projects. For example, the Shanghai Yangshan Deep-water Port was evaluated by the former Louis Berger Group. However, these types of third-party evaluations are mostly formative evaluations[132] conducted at the program set-up stage, aiming to determine whether the project is feasible and workable.

Part Four: Will a hybrid climate and energy governance model always be necessary? – The horizontal dimension of China's climate and energy governance

China's energy management and regulatory has been highly dispersed. Each particular energy sector is regulated by different departments, oversight and controlled by different government agencies. The current Energy Law in China involves more than 15 ministries, described as nine dragons running the energy sector.

First, numerous regulatory agencies are involved in the management of China's renewable energy resources, including but not limited to the NDRC, the Ministry of Industry and Information Technology (MIIT), the Ministry of Natural Resources, the Ministry of Ecology and Environment, the MOHURD, the Ministry of Transport, the MWR, the MOA, the NEA, the National Forestry and Grassland Administration, the National Railway Administration, the Civil Aviation Administration of China, and the China Railway Corporation.

Second, the electricity system reforms require stronger supervision mechanism to strengthen existing electricity market arrangements and in designing innovative financing instruments. When it comes to taking the lead, the NDRC and the NEA have weak monitoring capacity over various environmental and energy programs. For example, on one hand, local governments are crucial for guaranteeing the smooth implementation of projects under construction and avoiding abandoned unfinished projects; on the other hand, the Ministry of Finance, the China Banking and Insurance Regulatory Commission, the People's Bank of China, the China Securities Regulatory Commission, and the State Administration of Taxation are crucial for reasonably providing financial support and motivating private investment for these projects. Communication and coordination, as well as joint working forces, are very

[131] For details see Chapter 2.
[132] For details see Chapter 2.

much needed to ensure that all policies are implemented and become effective in time.

Third, there are different tendencies between governmental authorities targeting a greener energy mix. Department of climate change under the NDRC has been leading the preparation of the national carbon trading scheme (***carbon quotas***); The National Energy Administration (NEA) has been involved in designing a "***Green Certificate***" Trading Scheme together with the renewable portfolio standard (RPS); Department of industry and department of resource conservation and environmental protection under the NDRC has brought up the ***energy use*** trading scheme; The Ministry of Industry and Information Technology (MIIT) has proposed the ***carbon credits*** trading scheme for New Energy Vehicles (NEV)[133]; The Ministry of Finance has been designing a ***carbon tax***; The former Ministry of Environmental Protection (MEP) has been working on the ***pollutant permits*** trading pilot projects since 2007; The (newly established) Ministry of Ecology and Environment (MEE), together with the State Administration of Taxation and the Ministry of Finance have been taking charge of the ***environmental protection tax***; China also plans to implement a "***Green Dispatch***" system to favor low-carbon sources in the electric grid, as well as a "***Green Finance***" system aiming for providing financial instruments and technical support for all these approaches - various pilot projects, reform and innovation pilot zones, demonstration zones and demonstration projects are being put into effect in selected regions. This is not a full list of all the environmental/energy policies and programs China has launched in recent years. For example, different types of pilot projects in the solar energy field have been illustrated in Part 1 of this chapter. However, economic benefits would accrue from these programs in relation to the design of market policy, thereby requiring explicit goal-setting as to those who should gain how much, and how the gains should be accumulated, invested, and shared[134]. It would be more reasonable to create a decision-making process that can involves clear program evaluation system; in order to produce collectively valued tools and credible policies for meeting public aims, instead of relying on "genius" strategies from the central planners.

These institutional shortcomings in China's climate governance and energy regulation system have caused imbalanced power development and powerful monopolies in the electricity sector, tension between different government agencies both vertically and horizontally, a strong reliance on negotiated settlements rather than rule-based decisions, rising costs from new environmental mandates, and a lack of regulatory oversight, transparency, and evaluation process. A combination of carefully designed and implemented institutional reforms can lead to significant enhancements of the multilateral government agencies performance in every dimension under a variety of program settings – both environmental programs and other government organized programs.

---

[133] Parallel to the MIIT's NEV carbon credits trading system, the NDRC also proposed a NEV carbon quota trading system, potentially to be integrated into the national carbon quota trading system.

[134] Byrne, J., & Mun, Y.-M. (2003). Rethinking reform in the electricity sector: Power liberalisation or energy transformation. Electricity Reform: Social and Environmental Challenges, 48–76.

IV. Conclusion

In this chapter, we provide economic and institutional backgrounds to provide basis for understanding China's climate governance dynamics; we analyze institutional barriers relevant to key elements of China's climate governance and energy regulation; and seek to identify what are the key institutional problems to be overcome in bringing about a successful market-based reform and a modern regulatory system in China to be a platform for future discussion on what should China learn about how the standard environmental program evaluation model needs to be adapted for its own particular circumstances.

With China's significant role in climate change and related energy issues, more and more natural scientists, economics, political scientists and policymakers are in need of deep and up-to-date understanding of this increasingly important topic and China's relevant topic.

The dissertation proceeds as follows. We begin with a brief background to theories on environmental program evaluation in Chapter 2 and its theoretical significance. We then discuss important points of current environmental program evaluation in the Chinese context and general reform experiences with the various pilot projects. We conclude with some elements for future research into Chinese climate governance and policy implementation.

Chapter 2 Evaluating Environmental Programs in Theory

From the previous chapters, we learnt that China now has shifted its main environmental focus to climate change, and China has also generated some institutional reforms trying to better support its new round of market-oriented transition. We shall see in later chapters that better-integrated government institutions can be advantageous to unify rulemaking. However, without a carefully designed program evaluation system and specific decision-making procedures, the institutional reform alone cannot itself determine that future government policies and programs will be successful and effectively safeguarded.

I. Part One: Program evaluation and environmental policy

Program evaluation can be simply defined as "*systematic* procedures used in seeking facts or principles[135]", "the *systematic* collection of information about the activities, characteristics, and outcomes of programs to make judgments about the program, improve program effectiveness, and/or inform decisions about future programming[136]", "a form of appraisal, using valid and reliable research methods, that examines the processes or outcomes of an organization that exists to fulfill some social need[137]", or "*systematic* inquiry that describes and explains the policies' and program's operations, effects, justifications, and social implications[138]".

Unlike theoretical research, where scientists engage in "pure" research in science, traditional program evaluation research systematically examines social and human services programs for pragmatic and instrumental reasons. Evaluations are conducted for the purposes of programmatic improvement and used as a public management tool – a tool that helps to aid those decisionmakers to make better administrative decisions about social and human services programs and helps to make the best use of our resources in an effective and efficient manner. For example, under the policy A to policy B circumstance, the adoption of policy B should be made with an understanding of the reasons why policy A failed after a certain given period of time, or policy B is a less expensive program that can accomplish the same objectives of policy A.

However, this traditional results-oriented/outcome-oriented evaluation - the so-called "scientific approach" of program evaluation research, is not particularly appropriate in the development of environmental policy, since there are no simple and complete answers as "success" or "failure" facing complex sets of environmental policy problems. An investment in environmental quality is a long-term investment that results-oriented/outcome-oriented evaluations may be very difficult to measure in the short run, whereas an assemblage of individuals (program administrators, for example) may anxiously awaits the immediate results of such evaluations. Also, political pressures may outweigh the significance of any evaluation research results

---

135 Barker, R. L., & Others. (2003). *The social work dictionary*. Retrieved from https://norek.pw/kizu.pdf, at pp. 398.

136 Patton, M. Q. (2008). *Utilization-Focused Evaluation*. SAGE Publications., at pp.23.

137 Grinnell, R. M., & Unrau, Y. A. (2008). *Social Work Research and Evaluation: Foundations of Evidence-based Practice*. Oxford University Press, at pp.553.

138 Mark, M. M., Henry, G. T., Julnes, G., Mark, M., & Henry, G. (2000). Evaluation: An Integrated Framework for Understanding. *Guiding, and Improving Policies and Programs,* at pp. 3.

in many contexts[139], which will be discussed later in this chapter.

Hence, it is important to address the role of program evaluation research in the environmental arena. The purposes of this section are to discuss what kinds of program evaluation analysis are relevant in the development of environmental policy; to discuss what are the logic, purposes and motivations, the constraints and limits of environmental program evaluation; and to describe how environmental program evaluation gets operationalized and utilized in the real-world field.

Given the context that the more traditional scientific approaches of program evaluation are not particularly appropriate in the environmental area, what are some practical alternatives? What kinds of program evaluation analysis are relevant to successful environmental policy and effective program implementation?

Since the early 1980s, studies have been working on the development of the so-called practical methods - Including evaluability assessment, performance monitoring, rapid feedback evaluation, and qualitative evaluation, to name just a few. In addition to these practical approaches, evaluators have also created some other tools or practical techniques including cost-benefit analysis, cost-effectiveness analysis, cost-efficiency studies, performance indicators, user satisfaction studies, information management techniques, and others. Over time, many of these practical approaches and techniques for environmental programs have been used to try to respond to the critiques program administrators, legislators, and other government officials have made to the program evaluation field[140], and have received quite a bit of positive feedback. As a result, categories of the entire above environmental program evaluation methods and tools are numerous - some of which we will discuss later in this chapter, but they can be grouped into four most common categories of focuses:

IMPACTS EVALUATION - evaluations that focus on *environmental impacts*

Here, as we mentioned above, while outcome-oriented evaluations are still often considered as too “traditional” and not “particularly appropriate”, however, one should not lose sight of the value of the traditional scientific approach of program evaluation research. In the long run, additional research will be needed for comparing the cost-effectiveness of different policy instruments or combinations of policy instruments on the same environmental problem to show which one(s) will get the job done at the least cost or disruption to society[141]. Over years, studies have been working on examinations of program “output” or environmental “impacts” as opposed to “outcome” measures or actual changes in environmental quality. Thus comes the modern analytical method that closely links government programs with environmental impacts.

Here, environmental impacts evaluation (evaluations that focus on environmental impacts) should not be confused with environmental impact

---

[139] Landy, M. K., Roberts, M. J., & Thomas, S. R. (1990). *The environmental protection agency-asking the wrong questions*. Retrieved from https://www.osti.gov/biblio/6007856.

[140] Rich, R. F. (1993). *Program evaluation and environmental policy: the state of the art* (Vol. 29). Institute of Government and Public Affairs, University of Illinois, at pp. 35.

[141] Id. at pp. 39.

assessment (EIA). Generally, EIAs are conducted for program and activities not specifically directed toward environmental improvement or preservation[142] - such as hydroelectric dam, railway, and government building projects. Under such contexts, typically, they are designed to project the negative impacts of proposed policies or programs on natural environment in the formative stage of a project (ex-ante). Impacts evaluation, however, might be used in the summative stage of a project, to consider whether the program might be able to affect the environment favorably or in a more desirable manner (ex-post).

As a result, impacts evaluation is employed to see impact in longitudinal studies with comparison groups, and to influence policy[143]. In 1991, the Environmental Protection Agency (EPA) first began using an "environmental indicators" approach to study environmental program impacts in the United States. Detailed environmental indicators include physicochemical indicators, biological indicators, and socioeconomic indicators, representing different measures and variables selected by program evaluation researchers, analysts and evaluators. At the same time, many questions remain, for analysts and evaluators to address whether the identifications of such impacts can lead to better environmental policies in the long run.

FORMATIVE EVALUATION - evaluations that focus on acquiring information that assists with *(early) program improvements*

Before getting into this category, it is important to understand the two different designs of program evaluation – the summative evaluation and the formative evaluation.

Summative evaluation is designed to access the program's overall impacts and consequences after an appropriate period of time has passed, with the goal of determining whether the program is succeeding or has accomplished its objectives. Users of summative evaluations are often decisionmakers or policymakers outside of the program.

The formative evaluation, on the other hand, is designed to provide feedback and monitoring when the program is initially in development or is undergoing changes – for example, when an existing program is being modified or is being used in a new setting or with a new target population[144]. The feedback should, presumably, help in "fine-tuning" and improving programs as they are evolving[145]. These evaluations are often initiated and used in-house[146] - not to prove whether a program is worth the resources it receives but serve more to guide, influence, direct, stabilize and refine programs instead. It can also be used to determine whether a

---

142 Knaap, G. J., Kim, T. J., & Kim, T. (1998). *Environmental Program Evaluation: A Primer*. University of Illinois Press, at pp. 7.

143 Different Types of Evaluation | CYFAR. (n.d.). Retrieved December 12, 2019, from https://cyfar.org/different-types-evaluation.

144 Types of Evaluation | CDC. (n.d.). Retrieved from https://www.cdc.gov/std/Program/pupestd/Types%20of%20Evaluation.pdf.

145 Rich, R. F., no. 140 above, at pp. 30.

146 National Research Council, Institute of Medicine, & Committee for the Review of NIOSH Research Programs. (2009). *Evaluating Occupational Health and Safety Research Programs: Framework and Next Steps*. National Academies Press, at pp. 26.

new or pilot program has treatment fidelity. Thus, formative evaluations are not as threatening as other categories of evaluations and are often better received by agency staff. Detailed evaluation approaches under this category include locating model standards, getting expert consultation, and forming an ad hoc evaluation committee[147]; detailed evaluation techniques under this category include evaluability assessment and needs assessment.

PROCESS EVALUATION/IMPLEMENTATION EVALUATION - evaluations that focus on *program implementation*

Whereas formative evaluation, as stated above, is employed to shape new programs in their early stages to ensure that programs or program activities are feasible, appropriate, and acceptable before they are fully implemented, process evaluation, on the other hand, determines whether programs or program activities have been implemented as intended/designed once programs are a little older and more established. In another word, formative evaluation helps to develop *workable* programs and policies, whereas process evaluation helps to make sure programs and policies are *effective*.

Process evaluations are often described as analyses of what happens between program initiation and results, which means evaluation can be conducted anytime during operation of an existing program. It might want to examine and document what activities were conducted by whom, provided to whom, and how often, to help provide critical information for program improvement. Like formative evaluation, process evaluations conducted in the initial implementation of a program are often considered internal agency business as they may self-assess weaknesses or difficulties of a new or pilot project; whereas process evaluations conducted at the end of a program are typically required for program description function. In this case, evaluation is designed to analyze program implementation – activities of involved individuals and organizations, to identify why a certain program succeeded or failed and why benefits did or did not exceed costs, and to inform others about what they might expect if they were to replicate a similar program or to transfer the knowledge and technology from the program, and to use that information to guide programs tomorrow and thereafter.

Here, implementation successes mentioned above are not always judged by the stated goals or objectives of programs under process evaluation. However, progress toward a stated program goal or objective is one issue a professional evaluator should be prepared to address. Two primary approaches of process evaluation are program monitoring and quality assurance.

It is worth mentioning that institutional evaluation can go even broader than process evaluation, by looking beyond short-term measures of policy success and failure and ask out long-term changes in institutional behavior. Like process evaluation and formative evaluation, institutional evaluation also tends to be more descriptive and its focus is not on measurement of program outcomes or impacts. In

[147] Royse, D., Thyer, B. A., & Padgett, D. K. (2015). *Program Evaluation: An Introduction to an Evidence-Based Approach*. Cengage Learning, at pp. 131.

such case, program evaluations often serve instrumental or enlightenment functions - the former help to provide information that contributes to decisions that shape program goals, strategic plans, and actions; the latter help to increase general understanding of program operations, underlying assumptions, or social context by communicating program goals, accomplishments, and evaluation findings to external audiences[148]. Regrettably, institutional variables, particularly long-term institutional change, although so clearly merit attention, are always intentionally put aside by in-house policy and program evaluators of government agencies. Unlike impacts evaluation, both process evaluation and institutional evaluation give more attention to contested standards, disagreement or confusion over program goals and objectives, and institutional capacities for program implementation.[149]

EFFICIENCY EVALUATION/ECONOMIC EVALUATION - evaluations that focus on *program benefits and costs*

Resource constraints may lead to the invocation of efficiency studies, in which economic dimensions are central[150]. Data collected from efficiency evaluations using economic assessments can provide policymakers, politicians, the public, program administrators, and other potential users with information to make better decisions[151]. An informed individual or organization is more likely to support difficult choices once it is educated about the necessity and cost to take action.

Ethically, over years, academic researchers and most environmentalists were concerned about using economic approaches and techniques to measure environmental programs – they feel that environmental resources and all life forms simply cannot be measured and cannot be allocated and sacrificed by individual preferences. In fact, there are series of environmental program evaluation studies that distinguish evaluation from other types of economic analysis, including risk assessment, cost-effectiveness analysis, and cost-benefit analysis.[152] Realistically, however, there has been lots of studies suggesting that economic analyses and economic incentives can play a major role in the assessment and implementation of environmental programs[153]. The reasons are simple. Governments at present are not able to fully fund the range of policy activities and actions deemed essential to deal with new global environmental threats and risks, and few additional resources can be expected in the near future term.[154] Economic decisions surround us - especially when involved in weighing a range of possible intervention or treatment options. Environmental programs involve the use of scarce resources, and in evaluating the use of scarce resources it is only reasonable to compare the value of what the

---

148 Weiss, C. H. (1977). Research for Policy's Sake: The Enlightenment Function of Social Research. *Policy Analysis*, *3*(4), 531–545.

149 Knaap, G. J., Kim, T. J., & Kim, T., no. 142 above, at pp. 310.

150 Ibid.

151 Royse, D., Thyer, B. A., & Padgett, D. K., no. 147 above, at pp. 284.

152 Bennear, L. S., & Coglianese, C. (2005). Measuring Progress: Program Evaluation of Environmental Policies. *Environment: Science and Policy for Sustainable Development*, *47*(2), 22–39.

153 Knaap, G. J., Kim, T. J., & Kim, T., no. 142 above, at pp. 16.

154 Id. at pp. 294.

program provides with the value of what is forsaken.[155] Faced with limited resources and competing governmental programs, governments are required to set priorities, to determine which programs and policies are working well and which are not and what might be done to improve policy performance and to increase the likelihood that they can better target and allocate scarce resources.

Cost-effectiveness studies are important tools that can be used to help decisionmakers or policymakers constitute the best use of scarce resources[156] in the way it facilitates procedural change to influence the natural environment[157]. Further, an efficiency evaluation must analyze the costs and effectiveness of all competing interventions and reasonable alternatives – including the alternative of no program at all. Only then it is possible to ascertain if the intervention or treatment induced the most affordable procedural changes which had or will have truly the most favorable impacts on the natural environment.

Technically, however, the process by which the most efficient program is determined can be somewhat formidable, especially when facing with data limitations. Estimating the costs and benefits of administering and complying with environmental programs pose no unusual difficulties – air, water, species, landscape, ecological systems and other intangible benefits are not traded in markets and often do not have a clear monetary value; compliance costs are often estimated using information from complying industries or affected firms which might not be prompt and accurate. It is problematic. In fact, despite continuing ethical debate and technical impediments, cost-benefit analysis, cost-effectiveness analysis, cost-efficiency analysis, comparative risk analysis, and other forms of economic assessments will likely continue to be used to evaluate environmental programs.

From the above sections, we learned that environmental programs can be evaluated via impact, (early) planning, process, and efficiency designs. Although some environmental program evaluation studies have taken the narrow approach when defining program evaluation, distinguishing evaluation from evaluability assessment, needs assessment, logic model, performance measurement, risk assessment and other forms of economic assessments, this dissertation takes the broad approach. Because these different categories of evaluation designs are shown to be highly relevant to successful policy and effective program implementation, especially in terms of environment. Moreover, they are not always separated - for example, an evaluation can use a summative evaluation process, while having its primary goal as program improvement, which makes it a primarily formative evaluation. Also, each of the above four overarching focuses or purposes may have sub-goals or objectives - an overall environmental program evaluation design may include one or some combination of all four of these goals.

First, impacts evaluation seeks a bottom-line response to the question, “is the environment any cleaner as a result of this program?” This does not do justice to how program goals are achieved. Thus, for example, if an evaluation shows little or

---

[155] Knaap, G. J., Kim, T. J., & Kim, T., no. 142 above, at pp. 11.
[156] Royse, D., Thyer, B. A., & Padgett, D. K., no. 147 above, at pp. 296.
[157] Knaap, G. J., Kim, T. J., & Kim, T., no. 142 above, at pp. 11.

no improvement in air quality, a process evaluation may be required to illuminate major reasons. Finally, resource constraints may lead to the invocation of efficiency studies, in which economic dimensions are central.

II. Part Two: The logic, purposes and motivations

Environmental program evaluation centers on assessments of the extent to which policy interventions bring about change in the behavior of individuals and organizations and, in turn, to what extent these changes affect environmental quality.[158] As stated in the previous chapters, the author's purpose in preparing this dissertation was to stimulate thinking on the topic of environmental program evaluation on China's pilot projects in the climate governance and energy regulatory field, both the existing ones and new ones in the future. This purpose reflects the author's belief that systematic and sustained program evaluations can and should be carefully designed and introduced to China's bureaucratic, legislative, and institutional settings to guide and produce sound policy interventions in the future, that is, to redirect or reappraise policy goals, to diagnose or correct policy means that caused or might cause program failure, to set priorities or provide market-based incentives for environmental protection when facing insufficient resources, and to improve the quality of public decision making and program performance. Here, we must distinguish environmental program evaluation from the concepts of environmental auditing, environmental impact assessment (EIA) and other tools of the environmental management systems (EMSs) - environmental program evaluation focuses on measuring program progress and whether the program might be able to affect the environment favorably or in a more cost-effective manner, whereas environmental auditing and EIA, intend to measure the negative effects of certain activities on the environment against set criteria or standards, with the aim of reducing such adverse effects[159]. In particular, both environmental auditing and EIA are environmental management tools, but the former is carried out when a development is already in place, while the latter is an anticipatory tool legally mandated for many projects in most countries – including China[160]. These different models of assessments will inevitably result in different analytical objectives and become very crucial in our discussions on the role of environmental program evaluation in China's climate governance and energy regulation in Chapter 4.

However, one must not forget that program evaluation knowledge and other forms of systematic use of social science is not intended to replace experience, expertise, and managerial judgement in the agencies. Rather, as mentioned the previous section, program evaluation aspires to inform political decision making by clarifying issues and producing usable knowledge[161] - what program evaluations provide is merely a collection of facts, principles and other *information* that *examines*, *describes*, and *explains* the processes or outcomes of an organization that

---

158 Knaap, G. J., Kim, T. J., & Kim, T., no. 142 above, at pp. 321.

159 De Weerdt, H. (2013). Environmental Auditing and environmental Management systems. In *Environmental Management in Practice: Vol 1* (pp. 289–305). Routledge., unit 1, at pp. 18.

160 Id. at pp. 30.

161 Knaap, G. J., Kim, T. J., & Kim, T., no. 142 above, at pp. 295.

exists to fulfil some social need.

Meanwhile, although China has been putting more emphasis on market-based methods since its new round of institutional reforms, environmental programs still rely heavily on regulatory or command-and-control mechanisms for achieving goals and objectives, in part because environmental policy actions are often more complex administratively (as illustrated in the previous chapter). Thus, it is perfectly reasonable that much of the focus of environmental program evaluation is on improving the management of environmental programs. The management issues cover a wide range and include strategic planning and priority setting, recruitment of qualified personnel, and oversight and coordination of qualified personnel, program employees, as well as the outside contractors.

However, just as important and maybe more importantly for China, are efforts to strengthen the role of program evaluation in the formulation of environmental policy by the National People's Congress (NPC) and the executive branch (and, similarly, at the local level by legislators and governors). Program evaluation should not be seen as primarily an administrative function, because it must also play a central role in the legislative process.[162] From the previous chapter, we learnt that the laws and regulations of China's environmental field that have created the most aggressive regulatory programs and accompanying pilot programs are quite new. Laws and policies of China's climate governance and energy regulation are rather young and still evolving a lot in comparison with other areas. Thus, it is the author's belief that environmental program evaluation should be used to influence and improve the formulation of China's environmental policy.

Here, it is worth mentioning the logic of emphasizing the importance of promoting program evaluation as an integral part of the policy-making process, which also lies in much the same vein as the merits of process evaluation, to look at policy or program implementation. In the context of process evaluation that applies to environmental policy, "process" has two key dimensions – one is an assessment of the process for improving environmental quality and a collaborative decision-making process associated with improving the environment, that is, an assessment of the mechanisms for participation and not just outputs or outcomes from specific policy initiatives;[163] and the other dimension is the development of rules: the process used to determine certain environmental standards or rules are as important as the effect or outcomes of these standards or rules to policymakers, that is, as a vast body of both theoretical and empirical literature demonstrates convincingly, the existence or application of certain well-designed and specified standards or rules should lead to desirable outcomes, and if the process is flawed then its implementation is also likely to be problematic.[164] Equally important, besides "process", environmental policies also involve "product", that is, the institutional consequences of policy, which include, in this perspective, the impacts upon both the institutional objectives and the implementation process of the policy – in short, the institutional responses to

[162] Knaap, G. J., Kim, T. J., & Kim, T., no. 142 above, at pp. 321.
[163] Id. at pp. 32.
[164] Id. at pp. 65.

environmental policies and programs. In fact, most of the complying industries or affected firms in China only care about the *product* of environmental policies, and most of them have no doubt in the *process* by which decisions are made and priorities are set. What they do not realize is that the cross-media nature of these policies creates distinctive administrative implementation problems that directly affect the quality of program or policy outputs and impacts, which could not be resolved unless one examines the procedures by which outputs or outcomes are created.[165] The industries, firms, consumers and clients should not be only bystanders in the process of policy design and implementation. Thus, subjecting all environmental policies and programs to be formulated and administered by some single system government agencies without well-designed evaluation process fails to yield the insights possible from multiple perspectives and multiple approaches. The political/institutional context is critical to take into account in this regard, which will be illustrated in the next section.

Similarly, how the behavior of institutions or individuals affect program evaluations can only be understood by understanding who is conducting the evaluation, what is being evaluated, and how the evaluation is conducted. Political scientists and other public policy scholars have suggested the potential to bolster environmental program effectiveness through improved implementation, administrative reforms, and new policy mechanisms and policy development in the executive branch, where environmental program evaluation could also be utilized and help generate the most promising results.

Overall, China's lack of systematic evaluations of environmental programs has multiple explanations. One is timing. Most of China's environmental programs are relatively new and have only recently the supporting laws and regulations. Another is complexity. The fragmentation of China's current climate governance and energy regulation system complicates the task of unifying rulemaking and settling conflicts that come with the territory, jurisdiction, and different interest groups. A related reason is the difficulty of establishing linkages between environmental program evaluation and better environmental policies and programs, given China's long-time preference for relying on launching all kinds of experimental projects instead of cautiously examined prior reports and prerequisites – just because China's current policies have not yet successfully solved all of its environmental problems does not necessarily mean that program evaluation would be a better choice. Finally, one explanation lies in the resistance or fear of so called "democratic participation" and external evaluation or assessment from government institutions, whom often sees citizen input as an enemy of their discretion power. This resistance exacerbates the difficulty of reaching consensus on appropriate evaluation methods.

It is under these circumstances, that the development of China's environmental program evaluation is both challenging and promising at the same time. Climate governance is still a relatively young field in China. Consequently, the role of environmental program evaluation may be particularly important as we try to address serious issues in a timely fashion, and these explanations seem equally

[165] Knaap, G. J., Kim, T. J., & Kim, T., no. 142 above, at pp. 351.

applicable for environmental program evaluations in China. But there is more. These explanations turn out, like the symptom of an organizational neurosis, to express a more complex, deeply imbedded set of institutional conflicts and concealed needs that have shaped the whole process of managing and evaluating environmental programs.

III. Part Three: The constraints and limits - obstacles and pragmatic issues: politics, knowledge, and policy change

In short, institutional interests and forces, already exerting a potent influence upon program evaluation within the agency and among its regulated firms, can be expected to have an equally significant impact upon program evaluation from independent evaluators outside of the program. Thus, institutional forces are likely to be continually operative in shaping program evaluation. To succeed, environmental program evaluation must be carefully designed, and well conducted under difficult circumstances. There are a number of factors and limitations that tend to shape the use of environmental program evaluations as follows:

POLITICAL PRESSURE – political and bureaucratic forces overriding rational consideration of policy and program needs

One principle obstacle likely to be encountered in efforts to promote better program evaluation are political tensions inherent to the relationship between the agency and its regulated interests, as well as the government agencies themselves. In the field of climate governance and energy regulation, there are countless of conflicts over program goals and operations. Political pressures may outweigh the significance of any research results.[166] Thus, the use or nonuse of environmental program evaluations or other social science studies would seem to depend on the characteristics of the analysts and the policymakers, the interaction between them, and the political and organizational contexts (for example, the political needs of key administrators) in which both find themselves, regardless of the methodological rigor, purity, or the quality of program evaluations.[167]

There are a number of solutions one might consider for environmental program evaluations. Program evaluators should be alert to political and institutional variables affecting the utilization of the evaluation findings. Ultimate policy-making authority rests with top agency officials who set the policy agenda, and wise, farseeing, shrewd, organizationally effective administrators are always the most important but at the same time in shortest supply in the development of good programs. Inevitably, organizational politics will partly determine the extent to which evaluation results are utilized. It is important to recognize yet appreciate the importance of political constraints in program evaluation when faced with wavering and uneven political support and ensures that evaluations are not wasted because of their incompatibility with political concerns. In particular, the political character of environmental decision-making must not be overlooked in pursuit of a seemingly objective

[166] Knaap, G. J., Kim, T. J., & Kim, T., no. 142 above, at pp. 31.
[167] Id. at pp. 308.

evaluation. Evaluators must ensure that evaluations are *applicable* to all levels of management and suit the opportunities that are at present. Flexibility with and adaption to politically influential officials are other keys to acceptance of evaluation recommendations.[168] The design, conduct, and reporting of environmental program evaluation must reflect a firm understanding of policymaker and agency needs, and efforts to promote utilization must be an integral part of the evaluation process.[169]

At another level, however, program evaluation needs to challenge the way powerful interest group politics are thinking about environmental policy and consider a public interest that is not simply the aggregation of private interests. Government institutions are always more interested in using program evaluation to demonstrate program results than to reveal program deficiencies. Thus, it is important that program evaluation itself needs to be able to ask whether existing regulatory programs are addressing the right problems or are treating root causes rather than symptoms of ecological damage and environmental threats to public health. It must provide a means of escaping the preoccupation with short-run results and encourage long-run thinking.

METHODOLOGICAL WEAKNESS - the inevitability of methodological choice

Another major constraint is the methodology of environmental program evaluation research. An inappropriate study design, insufficient or questionable data and analysis (for example, inadequate or nonexistent monitoring and data), or conclusions that do not address questions held to be central concern by policymakers understandably are barriers to utilization.[170] This is particularly so when the policy or program evaluated is highly controversial.

The importance of choosing an independent evaluation methodology will become readily apparent if we consider the political and institutional impacts a program should have on an agency, as noted above. The development process of environmental program evaluation methodology is not a purely scientific exercise devoid of political concerns, for example, when selecting how program performance should be judged by what standards/variables, when using indirect methods to estimate certain program benefits, or when trying to establish an intersubjective methodology for implementation research. Rather, it is affected by allied interest groups, complying firms, business and industry, and other stakeholders. From an environmental science perspective, environmental problems may be systemic in origin, scope, and impact, but the policy response and intervention are often piecemeal and certainly non-systematic.[171]

In light of the difficulty of conducting comprehensive analyses, environmental program evaluations often adopt a more limited or simpler approach. Such approaches typically put emphasis on smaller, better-defined projects, tailor methodologies to fit the particular political and organizational context of the program and can be carried out in a reasonable amount of time at a reasonable cost.

---

168 Knaap, G. J., Kim, T. J., & Kim, T., no. 142 above, at pp. 14.
169 Id. at pp. 316.
170 Id. at pp. 309.
171 Id. at pp. 38.

They tend to answer the questions facing potential users, even if imperfectly and tentatively, instead of giving definite answers to questions that are not the central concern within an agency or the legislature.[172]

However, it is worth reemphasizing the importance of taking *multiple approaches* for environmental program evaluation, as it is clear that it will not be possible or desirable to apply one evaluation strategy uniformly. If the quality of information and the methodology used in environmental program evaluation is poor, stakeholders can selectively choose the study results that support their respective positions, thereby intensifying conflict over the climate governance and energy regulation mission.[173] To address such concerns, program evaluations need to go beyond single method research and take multiple approaches or so called mixed methods. Thus, the strength of simple evaluation designs mitigates the weakness of using multiple approaches (and vice versa). Only in this way can some of the methodological obstacles be dealt with.

ORGANIZATIONAL RESISTANCE - the "fear of evaluation"

Another notable conflict involves the administrative stonewalling inspired by organizational values and loyalties. Environmental program evaluation can prove beneficial for agency and program effectiveness over the long term, but many individuals (for example, program administrators, environmental engineers) are concerned about their short-term interests (for example, a possible promotion or program expansion in the near future), or some other demands for organizational resources, some of which may try to constrain political controversy by putting program evaluations research aside as unwanted information or even potential threat. Thus, organizational culture remained a significant barrier to the implementation of environmental program evaluations. Here, the critical element is *Multiple perspectives* upon which environmental program evaluation is so heavily dependent particularly when assessing the value or measurement standard of the evaluated programs.

A CONSTRAINED DEFINITION OF PROFESSIONAL ROLES

Program evaluation has not been matured as a field and as a profession in China while competing values and diverse stakeholders with different scientific evidence, engineering expertise and policy analysis are making it more and more difficult to reach one evaluation strategy uniformly. In the long run there is not a need for immediate results and independent investigators and evaluators with the ability to evaluate programs with multiple perspectives and approaches should be trained in order to create and expand professional teams in the program evaluation field.

KNOWLEDGE AND SUBJECTIVITY

Another set of factors involves conflicts among different agency personnel

---

[172] Knaap, G. J., Kim, T. J., & Kim, T., no. 142 above, at pp. 310.

[173] Id. at pp. 46.

attributable to distinctive professional backgrounds, perspectives, and functions.[174] It is hard to determine the influence of technical knowledge on decision-making or on policymakers' perceptions and attitudes[175]. The uncertainty of scientific and technical basis leaves competing political views and stakeholders to contribute their different interpretations of scientific evidence, engineering expertise, or policy analysis, and each of them brings to table differing perceptions and attitudes of risk and costs concerning the given environmental program or the proposed intervention.

In much the same vein, many questions remain, for analysts and evaluators to address whether the identifications of variable environmental program evaluation standards or criteria can lead to better environmental policies in the long run, particularly where measurement standards are in doubt or little agreement exists on their meaning and utility. While environmental program evaluation will never be a non-political exercise, the improvement of information used in evaluation will incrementally decrease the subjectivity surrounding the effectiveness of environmental programs.[176]

POLICY CHANGE

Throughout the history of China's environmental policy, environmentalists have faced the trade-off between investment in economic growth and investment in the environment where most of the times this trade-off is resolved in favor of economic growth by both central and local governments, while in recent years, climate change has turned into a central theme in all government strategies and actions.

Some of the policy change issues can be overcome only with less reactive policy-making at the top agencies. However, by better understanding organizational routines and procedures, policymaker values and attitudes, and political influences that will shape decision-making, evaluators might be able to learn how to achieve the so called "worthy objectives" in the often complex, rapidly changing and fast-moving environmental policy setting.[177]

ACTUAL CHANGES IN ENVIRONMENTAL QUALITY

Another likely obstacle to better evaluation will be environmental monitoring and databases, delayed effects of environmental changes, and related problems. It is still too early to assess how well environmental evaluations are succeeding in providing program officials with the information necessary to evaluate the short-term outcomes and long-term impacts of specific program activities. For example, many questions remain, for analysts and evaluators to address whether the identifications of the negative impacts of proposed policies or programs on natural environment can lead to better environmental policies in the long run. Agencies like the EPA and other departments are frequently attacked for lacking a sound scientific and statistical grounds for their climate governance, energy regulation, and other public actions. Our ability of assessing and establishing interrelationships among

---

[174] Knaap, G. J., Kim, T. J., & Kim, T., no. 142 above, at pp. 311.
[175] Id. at pp. 307.
[176] Id. at pp. 46.
[177] Id. at pp. 314.

different climate governance agencies' interventions or treatments and overall environmental quality should be improved. More studies need to move in this direction if environmental quality is to improve significantly in the future.

In addition to these reasons, inadequate dissemination of research, lack of usable standards, and resource constraints also account for the difficulty in evaluating environmental programs. Resource availability and practical concerns may reduce guiding legislative's impact on program intentions and activities. For example, in some places where economic climates are depressed, popular support for pollution prevention and emission reduction programs might be muted.

IV. Part Four: Environmental program evaluation in practice

What constitutes a program evaluation? How does environmental program evaluation gets implemented in the real-world field and with what consequences? To evaluate policy, environmental or otherwise, is to choose both policy and technique.[178] Before turning to the methodology issues for environmental program evaluation, it is necessary to discuss briefly how program evaluation guidelines get operationalized.

MEASUREMENT STANDARDS, TOOLS AND STRATEGIES

The primary focus of environmental program evaluation will be on evaluating the success of programs based on objective criteria. However, the context for setting these criteria seems to be dynamic and driven by other forces, and academic researchers studying implementation often choose their own measures and variables – some of which are illustrated by Table 2.1 below:

Impacts	Environmental indicators: physicochemical indicators, biological indicators, and socioeconomic indicators
Formative	Technical feasibility; political and administrative feasibility; the tractability of the problem; the ability of the program to structure the implementation process; the sociopolitical environment in which the program is placed; validity, reliability, and replicability
Process	Comprehensiveness; integration; promotion of ecological rationality; (economic) efficiency; legitimacy, responsiveness, or fairness of the implementation process; responsiveness to public needs; impact of the program on the poor; participation by significant interests; confusion of purpose/goal confusion
Efficiency	Cost-effectiveness; cost-benefit; comparative risk

Table 2.1 Environmental program evaluation measurements and viriables

Environmental program evaluations depend upon building consensus on appropriate measures of program success. However, the choice of agreed-upon measurement standards can be complex.

[178] Knaap, G. J., Kim, T. J., & Kim, T., no. 142 above, at pp. 63.

METHODOLOGICAL ISSUES

Whatever form of evaluation one examines, methodological problems abound.[179] Evaluation approaches and techniques span a wide range of methods and tools from relatively simple to the relatively complex, from quantitative to qualitative. Categories of evaluation methods include qualitative designs, statistical designs, cost-benefit designs, participatory designs, formative designs, and summative designs, to label just a few[180]; categories of evaluation techniques include cost-benefit analysis, cost-effectiveness analysis, cost-efficiency studies, performance indicators, user satisfaction studies, information management techniques, evaluability assessment, needs assessment and others. Other popular evaluation methods and tools include needs assessment, expert panel review, data envelopment analysis (DEA), bibliometric methods, case studies, interviews, and client satisfaction surveys.

Putting environmental program evaluations to work, the evaluation task is defined very broadly, for then the implicit choices involving different sets of criteria for the evaluation process may be obscured. If one considers the general problem of identifying the explicit process of the program evaluation task, the following steps become readily apparent.

1. Environmental evaluation context

There are a variety of factors that can affect the final evaluation design.

The time available to complete the study
The funding
The staff resources
The client population
The seriousness or urgency of the problem
The motivation for the evaluation
The purpose or intended use of the evaluation
The level of expected cooperation from clients, staff, and other stakeholders

Table 2.2 Factors affecting the final evaluation design

2. Steps in the evaluation process
    a. Framing the subjects
    b. When is evaluability assessment necessary?
    c. Determine what is of value in a program and which variables to measure
    d. Analyze program goals and objectives – not always the stated ones

Program success or failure is often judged against the stated goals of the program under program evaluation. However, the stated program/policy goals or anticipated consequences "are often poorly defined, can potentially conflict, and are sometimes misleading[181]". "Other times, a narrow focus on stated goals can cause

[179] Knaap, G. J., Kim, T. J., & Kim, T., no. 142 above, at pp. 301.
[180] Id. at pp. 5.
[181] Ibid.

evaluators to miss important effects."[182] Moreover, program goals or objectives, perhaps usually, are inconsistent and often change in the process of program evaluation. Policy actors are numerous, policies are complex, and interpretations of policy purposes are highly diverse. Other times, resource availability and practical concerns may lead to program intentions and activities that deviate from the guiding legislative directives. Thus, it is important for program evaluators to choose their own measures of program success.

e. Selecting the best evaluation measure – how to judge measured variables
f. How environmental changes should be judged, how to assess implementation success, or how to provide the balance required in complex regulatory decisions
g. Using environmental program evaluation – utilization of environmental program evaluation

3. Improving the evaluation process and recommendations for moving forward
    a. Treatment fidelity for new or pilot programs
    b. Follow-up on the evaluation reports
    c. Oversight of environmental regulations and programs
    d. Citizen input and "democratic participation"

It is through the dialogue between citizens and policymakers that effective and workable policy is developed.[183]

e. Extensive relevant datasets on which to base environmental program evaluation assessments – information, applicability, quantitative design, improvements in environmental monitoring and databases

A center for environmental statistics that would be able to compile, integrate, and assess trend data not only from state agencies' own activities, but also from local governments, industries, and private organizations. There is also a need for this center to be able to integrate the various streams of data.

Program evaluation has been a major part of tracking the effectiveness of programs in the environmental sector in light of the massive resources spent on these programs. However, environmental program evaluation has also faced with some critical problems and concerns when attempting to assess these programs.

[182] Ibid.

[183] Knaap, G. J., Kim, T. J., & Kim, T., no. 142 above, at pp. 32.

Chapter 3 Observations on the California Climate Bill AB 32 and selected cases of China's carbon trading program

In the last chapter, this dissertation went through some basic theories of assessing the strengths and weaknesses of existing and future environmental programs, steps of identifying what types of programs are most sorely needed, frameworks of conveying the needed information effectively to environmental policymakers. However, theoretical research does not provide a clear-cut conclusion on the choice of evaluation programs and a standard reform model under China's political culture, nor on the possibility to realize why does China need to bring in environmental program evaluation for its various environmental policy pilots and energy programs. Rather it is a case by case situation where different ideas of the ultimate climate policy package differ. Therefore, more empirical and comparative research is needed in the current Chinese context, and so are cautionary observations on the selected cases of environmental and energy programs both in China and worldwide.

Part one of this chapter will China's experience with carbon emissions trading. Part two places the observations and evaluation programs of the California Climate Bill in context and ask why China needs to seek to environmental program evaluation. Part three then provide a brief overview of other implications involved in introducing program evaluation theory from a comparative and transnational perspective.

I. Part One: Lessons learned from China's carbon trading pilots

CHINESE EXPERIENCE WITH CARBON EMISSIONS TRADING

In 2013, Chinese authorities initiated the country's first attempt at a domestic carbon market. In late 2011, China's National Development and Reform Commission approved seven pilot projects involving emissions trading schemes in Beijing, Tianjin, Shanghai, Chongqing, Hubei, Guangdong and Shenzhen, all very large metropolitan areas or provinces. The first five commenced operations in 2013, and by the middle of 2015, all seven pilot projects had completed the mandatory one or two compliance cycles.

The operational experiences and administrative lessons learned from meticulous evaluations of the startups and actual operations of these seven pilot projects should provide invaluable guidance for future policymaking and for the overall design of a national carbon emission trading scheme, which is slated to debut in 2016. This paper will detail the progress and current status of these initial pilot projects, including trading volumes and the values generated by trading carbon credits.

1. Implementation of the emissions trading pilot projects and a discussion of implementation and operational problems

The initial seven pilot projects for carbon trading schemes encompassed several key primary, secondary, and tertiary industries. These projects were also chosen to demonstrate the feasibility of such schemes in diverse geographical areas, all with unique levels of economic development and relative importance to the country's Central Government. Each specific region chose the key energy-consuming

enterprises and industries that would participate in carbon trading; these enterprises and industries reflect each city's or province's particular structures of economic development, industrial and energy production, and the consumption characteristics of its citizenry. Table 3.1 provides data concerning the different levels of development among the initial seven carbon trading pilot project areas and an indication of the projected targets for energy savings and emissions reductions. Table 3.2 illustrates some of the major variations among the pilot project sites in emissions covered and the industrial sectors involved in the local trading schemes.

Trial carbon market location	2010 population (million)	2010 GDP (billion US$)	Year-on-year change (%)	2010 per-capita GDP (US$	Year-on-year change (%)	2015 energy-saving target (% of 2010 levels)	2015 emissions-reduction target (% of 2010 levels)
Beijing	20	208	+10.3	11.2	+7.8	17	18
Tianjin	13	136	+17.4	10.8	+16.7	18	19
Shanghai	23	254	+10.3	11.2	+10.0	18	19
Hubei	57	236	+14.8	4.1	+23.1	16	17
Chongqing	29	117	+17.1	4.1	+20.4	16	17
Guangdong	104	680	+12.4	6.6	+8.7	18	19.5
Shenzhen	9	141	+12.0	13.9	+7.60	19.5	21

Table 3.1: Selected data on pilot project sites[184]

Scheme	2015 emissions reduction target (on 2010 levels)	Emissions covered (MtCO2e)	Sectors covered	Cap type	Start year
Guangdong	19.50%	388	Power, cement, iron and steel, ceramic, petrochemical, textile, non-ferrous metals, plastics, paper	Absolute	2013
Hubei	17%	324	Industry	Absolute	2013
Shanghai	19%	160	Iron and steel, petrochemical, non-ferrous metals, power, materials, textile, paper, rubber, aviation, railways, commerce, finance	Absolute	2013
Tianjin	19%	160	Iron and steel, chemicals, power, petrochemical	Absolute	2013
Shenzhen	21%	33	Industry, public buildings	Intensity	2013
Beijing	18%	50	All companies meeting inclusion criteria	Absolute	2013
Chongqing	17%	0	254 companies meeting inclusion criteria	Absolute	2014

Table 3.2: Key differences among pilot project sites[185]

For example, the carbon trading system of Beijing targeted large-scale public buildings, the power-generation industry, and large manufacturing plants; this

[184] Shuang, L., & Nan, X. (n.d.). Data gaps hobble carbon trading. Retrieved September 11, 2012, from https://www.chinadialogue.net/article/show/single/en/5093-Data-gaps-hobble-carbon-trading.

[185] Analysis: China's big carbon market experiment | Carbon Brief. (2014, September 2). Retrieved September 2, 2014, from Carbon Brief website: http://www.carbonbrief.org/analysis-chinas-big-carbon-market-experiment.

strategy was quite similar to that of Tokyo, Japan, which is also an expansive metropolitan area with one of the largest populations of any city on the world. Guangdong, a populous southern province, elected to offer these trading schemes to the top four local industries with the highest emissions: steel, ceramic, electricity generation, and cement.

Similarly, the pilot project of Hubei, a large central province, focused on the steel, chemical, cement and power-generating industries. At the same time, Shanghai, one of the world's largest cities, decided to target hotels, convention centers, train stations, airports, shopping malls, banks and other service sites. However, it is unclear if Shanghai's experiment to concentrate of these service industry companies will produce the desired results. As a developing country, China's largest sources of air and water pollution, its primary industries, continue to operate with low energy efficiencies and with enormous economies of scope as strategies to reduce emissions. The service industries share none of these characteristics.

These regional differences offer reasons why each of the seven pilot projects have established their own unique set of priorities and requirements regarding the policies and procedures that would govern each local operation, as well as the objectives of each project. However, these policy variations provide incentives for certain potential carbon traders to move to other regions to exploit the advantages of these different policies.

For example, the increasingly prosperous southern province of Guangdong, with its strongly export-oriented economic structure, is the site of one carbon trading pilot project. However, as the costs of manufacturing locally are rising and are projected to continue to rise, many factories and chemical plants would find it financially advantageous to move operations to neighboring areas that could provide workers at much lower costs. This threat of losing large industrial constituents is a worrisome prospect for all cities and provinces that are more economically developed.

Additionally, these pilot projects have become sources of inter-regional rivalry as each city or province vies to become the leader of the national carbon-trading program. Regional protectionism also plays a role as each region strives for national preeminence by enacting legislation designed to create quasi carbon trading monopolies on key industries. There is the real possibility that adding more pilot projects might increase resource redundancy and waste national resources.

As China embarks on these pilot projects, it must balance the nation's development interests and its attempts to ameliorate the effects of increasing industrialization and the accompanying amounts of waste emissions and other pollutants. Government leaders are concerned about maintaining the country's robust GDP growth, but they are mindful of the need to meet their national and global targets for the reduction of emissions. National leaders want to avoid the possible social unrest that could result from unmitigated choking air pollution in cities such as Beijing and Shanghai. At the same time, each pilot project site has its own sets of industrial production supply and demand that must somehow coexist with public demands for cleaner air and water. The carbon trading schemes provide one way to reduce emissions while compensating local industries for any financial

losses with revenues from carbon credit trading.

The noble goals of China's carbon trading scheme could be derailed by political gridlock and the competition between multiple agencies that have legal or financial jurisdiction over the same pilot project. The government mandate of the Economy and Information Technology Commission (EIT), an agency of the Ministry of Industry and Information Technology, has traditionally governed industrial enterprises since the country's inception in 1949. The concept of saving energy has been at the core of their mission during the past half-century.

On the other hand, the Development and Reform Commission (DRC) that has been given authority over the carbon trading pilot projects. In several of the pilot project regions, the EIT polices the production of energy, while the DRC is charged with controlling emissions and managing the carbon-trading scheme. Frequently, the objectives of these two agencies conflict with each other.

It is not unusual for China to have competing agencies in charge of the same industry or government program. However, this condition is a prelude to future inter-agency conflicts and uncertainty on the part of the industries and regional administrators. Historically, in most cases, the aims of the EIT take precedence over those of the DRC, since economic development is the national governments preeminent objective. The inevitable outcome of this quandary is that the emissions controls programs are less effective than originally anticipated. Moreover, in the European Union and the United States, the normal modus operandi is for carbon trading regulators and agencies to have clear mandates and independent management with minimal interference from other agencies.

These agencies that operate with competing mandates and priorities in relation to the governance of the carbon-trading schemes create the real possibility of political gridlock, which could lead to resource allocation inefficiencies and management uncertainties. On the other hand, perhaps a certain level of interagency competition would spur each agency to operate more efficiently and strive to reach their objectives more quickly. Based on past experiences in China, this scenario is unlikely.

2. A lack of credible statistical data surrounding the Carbon Disclosure Project (CDP)

The Chinese central government considers economic development its top priority along with social harmony. As a result, the enforcement of emissions violations by the large chemical and manufacturing concerns has been remarkably lax. This lack of agency pressure and enforcement has been exacerbated by vague policies and toothless laws that carry little or no penalties for infractions. In addition, companies have weak internal oversight capabilities on the firm's emissions because firms indubitably consider profits and growth as much more important that pollution control matters.

Reliable data about pollution levels in and near chemical plants and manufacturers is difficult to obtain. At this time, there are no national laws that force companies to measure and monitor pollutants emerging from their facilities; nor are there any enforceable regulations that direct companies to divulge the types of

constituent quantities of their waste effluents. Regional laws and legal oversight vary by province and city. Therefore, the compilation of data from plant effluents and nearby water and soil has been spotty at best in the locations of the seven pilot projects in the carbon-trading scheme.

The operators and management of these pilot projects have had only a few years to prepare for startup and dedicated operations. There has been no systematic and complete collection of statistical data about the greenhouse gas emissions from the companies enrolled in the pilot projects. The government policies, laws, and the carbon-trading scheme, if based on inaccurate, old, or otherwise misleading data, might have problematic design flaws. The overall carbon emissions targets might be set too high or too low, or the existing energy consumption baselines might be erroneous or unreasonable.

Fortunately, the cities of Beijing, Shanghai, and Tianjin have developed comprehensive and accurate energy consumption data reporting system. Consequently, their emissions trading systems have been developed and finalized more quickly and completely than the pilot projects in the four provinces. Should China wish to extend this carbon-trading scheme to outlying provinces, such as Qinghai, Xinjiang, or Tibet, then there would be a significant time lag in doing so, since these provinces do not have comprehensive or verifiable data collection systems in place. Moreover, all seven cities and provinces with pilot projects have a dearth of qualified managers, scientists, and operators with the skills required for efficient and effective project management, analysis, and operation. Even though these pilot projects are crucial steps that should pave the way to future expansion of the carbon-trading program, the budget and manpower allocations remain quite low. Currently, China's pilot carbon-trading projects exhibit low trading activity, market liquidity, and readily available electronic price quotes for carbon credits. The Chinese market is quite immature compared to the EU's carbon-trading markets. This lack of active transactions could be the result of companies not having the proper incentives to trade their carbon credits. Additionally, the low trading activity produces large buy-sell spreads that might not accurately reflect the actual market.

This limited number of active trading volumes and values contributes to an incomplete cap-and-trade system and oversight system. The national program is weakened by a lack of detailed operating guidelines and vague enforcing procedures that are also applied differently in each pilot plant region. Since the announcement of this program several years ago, the pilot projects continue operating with very little clarity or additional guidelines from the central government.

In the absence of an efficient market, the government might consider undertaking some specific remedies to the perceived or real problems. One such remedial action would be to distribute free carbon quotas during the early stages of operation of the seven pilot projects. This action would provide definite incentives for companies to actively engage in the carbon trading. As the program grew, the carbon credit auctions could be expanded as well. However, an excessive amount of free quotas could have the effect of reducing further the carbon trading activity. The central government must determine the proper balance between industrial

production and emissions controls.

In order to increase effectiveness, the carbon-trading program should encourage efficiencies requiring all trading companies to conduct periodic cost-benefit analyses on their carbon trading. Moreover, any free quotas and penalty enforcements must be distributed fairly. For example, allocating carbon quotas based on the companies' carbon emissions in prior years might be not fair to companies who adopted better energy consumption efficiencies or to companies who had actively reduced emissions in those prior years. Allocating carbon quotas based on industry averages might also be problematic, since the range might be immense between the most effective and least effective companies in terms of emissions control.

How does China compare with the carbon-trading experiences of the EU and the United States? The EU, operating under the Kyoto Protocol (Directive 2003/87/EC) mandated its member nations to achieve a target of a 20% energy efficiency improvement by 2020, promulgated in its Directive 2009/29/EC. However, due to the European debt crisis of the past two to three years, the price of carbon declined from over $40/ton to less than $4/ton.

Meanwhile, the United States chose to pursue a non-Kyoto track by unilaterally passing various pieces of legislation: the legal precedents resulting from Massachusetts v. Environmental Protection Agency in 2007, the Omnibus Clean Air Act of 1990, California's Assembly Bill 32 (the California Global Warming Solutions Act, signed into law 2006), the 2009 Regional Greenhouse Gas Initiative (RGGI), the 2010 Western Climate Initiative (WCI), and the 2009 American Clean Energy and Security Act (ACESA)[186] . California's state government faced protests from nearly 600 manufacturers when the state's carbon trading market began in 2013. The companies' representatives stated that they were forced to raise product prices, reduce the workforce, or move to other states due to the expanses of California's emissions trading program.

The global carbon market schemes have definitely had an impact on China and its own domestic program. China has felt increased pressure from the developed nations to curb its emissions, especially those from coal-burning plants, to become more in compliance with international standards. The current global economic downturn, coupled with China's transition to more service industries, has diminished its perceived need to reduce carbon emissions. As a result, the world's carbon trading prices have plummeted. On the other hand, the carbon trading markets of the United States and Europe have continued to grow and expand in scope and industrial constituencies.

3. Important ways that China might improve its carbon trading program

One obvious step would be to significantly increase the number of laws passed regarding the carbon-trading projects and the enforceability of any infractions. Heretofore, China has been a nation that has used vague policies in lieu of laws debated and passed by a bona fide legislature. The policies were often viewed as mere suggestions without any genuine penalties. All other developed countries have complex sets of codes and laws that bear definite penalties for non-compliance. In

[186] Proposed but not enacted (passed only by the House, not the Senate).

addition, these laws are, for the most part, uniformly enforced in every state of the US and every country of the EU. There are strict disciplinary penalty mechanisms and the companies' legal liabilities are enumerated in great detail. It is essential that contracts and agreements must be enforceable under clear rule of legislated law in China.

Diverse environmental statutes or regulations govern the various pilot cities and regions; many times, these statutes in one province or city have do not exist in other provinces or cities. Only Shenzhen and Beijing, two large cities with large international populations, have implemented relatively modern and effective environmental regulations. The other five pilot cities and provinces are governed only under administrative rules and regulations, and even on the basis of a plethora of "red tape" documents with limited enforceability power.

With regards to the budding carbon-trading program, there is a distinct lack of a unified national standard of performance for the seven pilot projects. Typically, Chinese government agencies and state-owned enterprises prefer regulations, which can provide them with substantial discretion in their operations; historically in China, the details of these regulations have not been transparent to the general public. A well-publicized national standard of performance could give the general public a measure by which to judge these large manufacturers and chemical plants – understandably, these companies are not comfortable with that option.

Today in China, the various market oversight standards, whether regional or national, are inconsistent at best. It is difficult to ascertain the qualifications of the management teams of the companies working under the carbon-trading scheme. In addition, it is almost impossible to independently verify their public pronouncements or the effluent data they publish.

Similarly, it is exceedingly difficult to monitor illegal market practices, such as insider trading and market manipulations by those insiders. As yet, China does not have a credible measurement, reporting, and verification standard that could be reliably applied to the carbon-trading program. Any future national performance standard would have to be open to independent third-party verifications, a concept which the government officials have not embraced. Any new laws or policies governing the pilot projects should be legally and economically sound, yet practical and easy to implement.

There is a critical need in China to create more innovative institutions and companies. With a large variety of companies and organizations under the auspices of the carbon-trading program, incentives become imperative to persuade these commercial entities to actively engage in carbon credit trading. Politicians and political organizations must work with industry to structure partnerships that would allow the trading program to proliferate in win-win scenarios for both government and the affected companies. Both sides must be willing to sacrifice some interests for the greater good – the reduction of pollution from these facilities and higher profits for the companies.

Industrial and government organizations must collaborate to obviate any free-rider problems in the trading scheme. To ensure long-term success and continued

growth, the carbon emissions trading system must attract exemplary talents with advanced scientific, technological, management, or financial expertise. At this stage in the pilot projects, the government nor the participating companies have allocated the requisite funds to attracts those superior talents. In the interim, both parties should form partnerships with universities, think tanks, foreign colleagues, and possibly with other non-governmental organizations (NGOs).

Throughout its history, China's emperors and other leaders have employed top-down channels for the dissemination of information and decisions; this must change in order to foster creativity and innovation. This top-down policy design process is strongly contrary to the methods of the developed countries in Europe and North America. In today's China, government agencies do not possess the requisite information require to make sound management decisions. Without detailed information generated at the local level, national policies are generally too broad and impractical. The carbon-trading program lacks the information-gathering mechanism for obtaining accurate data on emissions

This novel information-gathering mechanism could be based on several important external factors. The first would be a uniformly accepted method of statistical analysis commonly used in the developed countries of the world. In this way, China's carbon scheme would operate on the same basis as those of other major countries. Second, participants in the carbon program could utilize the information disclosure regulations that apply to listed public companies. This would greatly enhance the program's transparency, which in turn would augment the accountability and credibility of all parties. Third, the different and sometimes competing regional and national government agencies, the participating companies, and other institutions would cooperate for the success of the carbon program. Of course, this cooperation would sometimes involve necessary compromises. Fourth, create a national registry and database that would contain all crucial information about every party in the program. Fifth, incorporate a company's environmental protection index into the calculations of their credit worthiness by local lenders. Last, allow independent third-party verifications of effluent monitoring and financial data. These independent parties would verify all carbon emissions; this would provide a solid foundation of credibility for the entire carbon-trading program.

The role of non-governmental certifiers and verifiers for environmental governance cannot be overstated. In the EU, traditional bureaucracies gradually lost the confidence of the people for proper governance; the European citizens responded with workable plans of deregulation, privatization, and trustworthy third-party independent entities. China must decide this question: Does it need to create a new national government agency for reliable or should this mission be performed by independent agencies? As the carbon-trading scheme becomes more known in China, its citizens are actively calling for verifiable emission data.

There are a few internal factors that provide incentives to each participating company. First, the accurate calculation of the costs and revenues of any carbon trading should be completed prior to any participation in the scheme. Ideally, this program would provide additional profits to the participants while reducing

pollution. Second, third-party organizations, such as universities or scientific institutions, could be used to collect and disclose emissions data accurately and reliably.

The areas of accountability, program transparency, and public input are vital for a successful carbon program compatible with global standards, but what would the correct procedures be for China for these areas? Regarding accountability, how should China create legal and administrative structures that would hold agencies responsible and accountable? In the area of transparency, the participants and the public alike must have reliable data, procedures, and have access to major government plans in this sector. It is certain that the carbon market cannot operate efficiently without a transparent environment. The more transparent government agencies are, the more easily for special interest groups to participate in government decision-making.

A market-based approach to solving national problems has historically been less than successful in China. The reluctance of the leaders to allow the public to share in decision-making is one contributing factor. Another obstacle is the lack of oversight of programs and resource allocations at the local and provincial levels. Information is regarded as power in China and individuals and the government are resultant to share knowledge.

Similarly, there is the question of disseminating knowledge and benefits of the carbon-trading program to parties through the Chinese nation and culture. Education of individuals should commence even at the high school level, and certainly at universities. The program must have competent manager, scientists, and operators. Prior to the beginning of the pilot projects, the DRC and other government agencies were not able to conduct sufficient research to ascertain the actual costs of this program and its impact on the Chinese society.

Local governments and many large companies are risk averse; this is due partly to their culture, but mainly to not having enough information about costs and realistic revenues. Therefore, these parties might be defensive regarding the immature carbon markets; this, in turn, would weaken the government's ability to provide incentives and to enforce the relevant legislation.

One government initiative that would benefit the carbon trading schemes would be the establishment and promotion of a low-carbon products identification system for the general public. This would probably increase the competitiveness of the program's participants and increase public awareness and acceptance of carbon trading.

Carbon prices vary widely between programs in the EU, the US and in China. Table 3.3 indicates the highest, lowest, and current carbon prices of each of the Chinese pilot projects and the emission trading system of the EU.

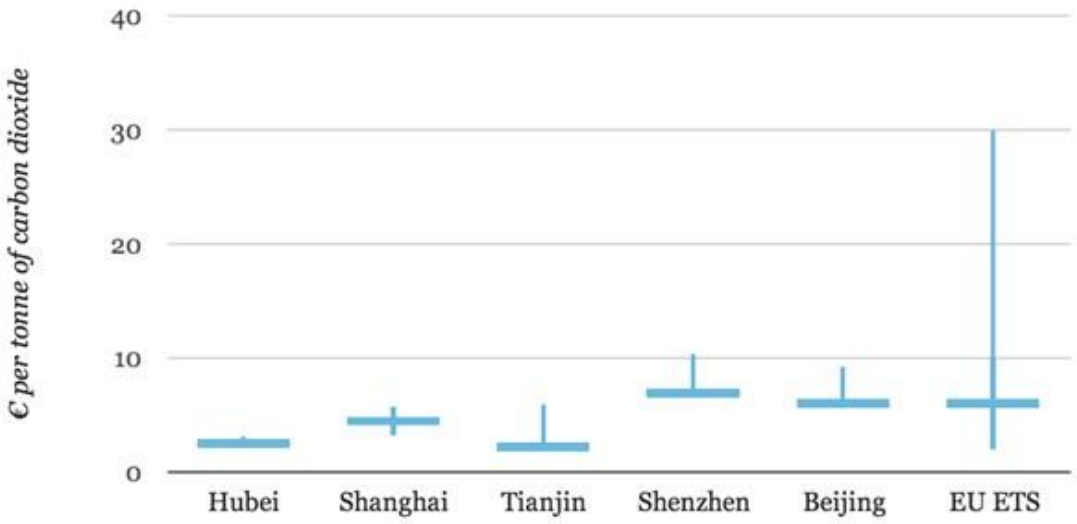


Table 3.3: Comparative costs of carbon[187]

It is imperative for Chinese policymakers to understand the machinations of the carbon market. Only with that knowledge would they be able to construct proper incentives that would encourage the corporate participants to actively trade carbon, while consumers would be more willing to purchase low-carbon products. China needs more public servants who are willing to innovate.

Markets tend to frustrate market regulatory policies due to markets' lighting speed, diversity, informational demands on regulators, price and substitution effects, trans-jurisdictional effects, political influence of market actors, enforcement obstacles, rational expectations, lack of good substitutes for market ordering, moral hazard, as well as black or "informal" markets[188], especially in an area, such as China, where the market forces have not been fully developed. Carbon permits are not readily redeemable for cash as are gold, oil, and natural gas. Without carefully designed, reliable emission controls and credible quotas, they would not be valuable.

China must embrace the notion of innovative carbon financing. There should be an exchange where carbon futures contracts are traded. The China Securities Regulatory Commission, the Futures Exchange, and the Carbon Exchange must all cooperate in this endeavor. In this way, market forces would efficiently regulate carbon prices according to the vagaries of supply and demand; this is normal for the US and the EU carbon markets.

An idea proposed in the West is the establishment of a Carbon Bank that would issue a variety of financial instruments, including carbon credits, carbon trusts, and carbon insurance. Currently, China's monetary and financial sectors have almost nothing to do with the carbon trading. The country's green finance industry is just starting to emerge. Having tradable futures contracts would change that.

Improving the capabilities of China's financial institutions in the carbon trading arena would complement a much-needed transformation from regional voluntary

[187] Analysis: China's big carbon market experiment | Carbon Brief. (2014, September 2). Retrieved September 2, 2014, from Carbon Brief website: http://www.carbonbrief.org/analysis-chinas-big-carbon-market-experiment.
[188] Schuck, P. H. (2014). *Why Government Fails So Often: And How It Can Do Better*. Princeton University Press, at pp. 207-228.

trading to national mandatory trading.

In the United States and Europe, the electric utility industry is the principal source of energy that is consumed by the nation's end-users. Logically and economically, that industry became the prime participants in the American and European carbon trading schemes. Regrettably, China has monopoly issues in this sector. Its electric utilities are overwhelmingly government-owned, while privatization efforts are making scant headway. The government agencies do not consider market forces when making their production and distribution decisions; this is neither rational nor does it optimize profits. As a result, mandatory carbon trading may cause emission reduction initiatives to increase costs, thus creating a disincentive for the electricity producers. Fortunately, the private companies involved in the growing renewable energy sector are quote responsive to market forces and this carries hope for China's future.

China must find the proper balance between economic growth and environmental protection. A viable carbon trading system could facilitate that balance. Finding the optimal amount of regulation requires that all parties – government and industry participants – do a better job in considering the possible trade-offs of different scenarios than today's poorly cooperating agencies.

Lastly, it is a fact that China's traditionally robust economic growth is slowing down. What would a recession mean for carbon trading? A reduction in industrial production would invariably lead to fewer incentives to engage in emissions reductions. The same argument could be posited for a China that transforms from an industrial society into one of services, much like Japan, Korea, and the West. Nonetheless, carbon-trading schemes should become mainstays of any major country, regardless of its industry-service mix. Emissions must be reduced, and a strong carbon-trading program could help China attain that objective.

CASE STUDY: THE RELATIVELY SUCCESSFUL SHENZHEN CARBON TRADING PILOT

1. The Shenzhen regional pilot ETS

The MEE will put over around 6000 representatives of both regulators and key emitting entities into its eight batches lists of 17 national carbon market training sessions in late 2019 to better reinforce understanding of the top design of China's national carbon market and meet market changes and management capacity[189]. As China so far has put more and more high-energy intensive sectors and emitters covered in several steps, and the trend has been set, market participants can get involved in forms of either direct emissions or indirect emissions. During this process, the government will support activities as long as they are conductive to promote active and orderly operation, more market liquidity and trading volume in the carbon market.

The Shenzhen regional pilot ETS, as China's earliest carbon market, is a relatively positive test case of China's plans to control carbon emissions while mitigating

[189] *汤金兰*. (2019, October 23). *生态环境部举办全国碳市场系列培训班*. Retrieved November 28, 2019, from http://qhs.mee.gov.cn/gzdt/201910/t20191023_738770.shtml.

excessive compliance cost of ETS-covered enterprises by bringing foreign investors[190] and the electronic bidding system[191]. Five years after launching the Shenzhen regional pilot ETS, in June 2018, the total trading value of Shenzhen ETS had reached one billion RMB[192]. The Shenzhen ETS currently is preparing to be one of China's most successful and active regional carbon trading market with the most trading volume and turnover[193] as it has grown fast and outperformed the other regional carbon markets in recent years.[194] It was also considered a model case by China's climate governance and energy regulatory authorities to present to international audiences in the 2018 Global Climate Action Summit.

Shenzhen is a major city located in the southern coast of Guangdong province, bordering Hong Kong. It is known for its history of being a pioneer and an experimental ground of the "reform and opening-up" policy brought up by President Deng Xiaoping, guided by the ideals of "socialism with Chinese characteristics". As China's very first Special Economic Zone, it is given the privilege to embrace market capitalism and the right of provincial-level economic administration, which has attracted increasing numbers of migrants from mainland China as well as many foreign investors.

The Shenzhen ETS is the first urban-level ETS to operate in China[195], as the city is primarily known for its high-tech industry and growing service industry. Therefore, the proportion of direct emissions from Shenzhen's power, manufacturing and construction sectors has been dropping while the proportion of indirect emissions (consumption of purchased electricity, heat or steam[196]) from the transport, residential and commercial sectors is increasing. Table 3.4 gives a summary of key features and innovations of the Shenzhen ETS attached as below.

Item	Shenzhen ETS
Regulated emissions, sectors and enterprises	The Shenzhen ETS covers both direct and indirect emissions from the most sectors and entities, leading to a greatest share of covered emissions in the total emissions comparing to other pilot regions.[197]

[190] *大湾区碳金融市场跨境合作在有序推进，境外投资者参与境内交易逐步便利化_中国碳排放交易网*. (n.d.). Retrieved November 27, 2019, from http://www.tanpaifang.com/qingjienengyuan/2019/0722/64779_6.html.

[191] *中国碳排放权交易产品、模式、市场和碳金融衍生品——浅谈十个点* | China Law Insight. (2017, November 3). Retrieved November 28, 2019, from China Law Insight website: https://www.chinalawinsight.com/2017/11/articles/dispute-resolution/%E4%B8%AD%E5%9B%BD%E7%A2%B3%E6%8E%92%E6%94%BE%E6%9D%83%E4%BA%A4%E6%98%93%E4%BA%A7%E5%93%81%E3%80%81%E6%A8%A1%E5%BC%8F%E3%80%81%E5%B8%82%E5%9C%BA%E5%92%8C%E7%A2%B3%E9%87%91%E8%9E%8D%E8%A1%8D%E7%94%9F/.

[192] *深圳碳市场成交额突破十亿元 - 深圳排放权交易所*. (n.d.). Retrieved November 27, 2019, from http://www.cerx.cn/Inews/8390.htm.

[193] *深圳碳市场迈入 10 亿元俱乐部 累计成交额在全国七个碳交易试点省市中排名第一_碳市场【中国碳交易网】*. (n.d.). Retrieved November 27, 2019, from http://www.tanjiaoyi.com/article-24532-1.html.

[194] *7 个试点碳市场累计成交 71 亿，十四五扩至石油、化工、钢铁和民航*. (n.d.). Retrieved November 28, 2019, from https://www.yicai.com/news/100337566.html.

[195] Jiang, J. J., Ye, B., & Ma, X. M. (2014). The construction of Shenzhen's carbon emission trading scheme. *Energy Policy*, *75*, 17–21, at pp. 17.

[196] Id. at pp. 18.

[197] See no. 194 above.

Allowance allocation methodology	Together with the Guangdong pilot ETS, the Shenzhen ETS takes an intensity-based cap and a unique game-based means[198] of allocating allowances in one given sector by historical intensity and benchmarking.
Trading products	Chinese Certified Emissions Reductions (CCERs), which gave way to the Voluntary Greenhouse Gas Emission Reduction Trading Registry[199]
Market stabilization mechanism	The municipal government of Shenzhen has reserved some allowances to prevent the dramatic price fluctuation, including a buyback mechanism with the annual buyback amount capped at 10% of the total allowances in that year,[200] and 3% auction or 2% fixed-price sell of allowance from the Allowance Price Containment Reserve (APCR).[201]
Carbon price fluctuation	The carbon price for Shenzhen fluctuated the most when compared to other pilots.
Penalty system	Shenzhen was the only pilot to implement a variable fine, setting as three times the market clearing price times the excess emissions. Other pilot programs charged a flat fee.[202]
Legal basis	Passed legislation through local legislature

Table 3.4 Key features of the pilot ETS in Shenzhen

As a special economic zone inside of the Guangdong Province, the Shenzhen regional pilot ETS is a unique case when analyzing possibilities for bridging local carbon market with other existing or planned ETSs,[203] as it is under the Guangdong regional pilot ETS and yet it has its own sets of regulatory design, enforcement, and trading practice. Moreover, the Shenzhen ETS has been attempting to strengthen communication and interaction with ETSs around the world for improved cooperation in the future, as "the future of carbon trading lies in a further expansion and the creation of a global carbon market."[204]

2. What are the benefits of pilots and the goodness of China's approach?

Before turning into the California case, it is worth pausing to consider the goodness of China's pilot programs in its environmental field.

a. Brave innovation and cautious practice

Along with the carbon market, Shenzhen also acts actively in the electricity

[198] For details, see Zhang, Z. (2015). Carbon emissions trading in China: the evolution from pilots to a nationwide scheme. *Climate Policy*, *15*(sup1), S104–S126, and 《深圳市碳排放权交易管理暂行办法》, Shenzhen Municipal Government. (2014), Article 7.

[199] See "Interim Measures for the Administration of Voluntary Greenhouse Gas Emission Reduction Trading". Retrieved November 28, 2019, from the International Energy Agency website: https://www.iea.org/policiesandmeasures/pams/china/name-162938-en.php.

[200] Zhang, Z. (2015). Carbon emissions trading in China: the evolution from pilots to a nationwide scheme. *Climate Policy*, *15*(sup1), S104–S126.

[201] Jiang, J. J., Ye, B., & Ma, X. M., no. 195 above, at pp. 19.

[202] Zhang, Z., no. 200 above.

[203] Jiang, J. J., Ye, B., & Ma, X. M., no. 195 above, at pp. 21.

[204] Perdan, S., & Azapagic, A. (2011). Carbon trading: Current schemes and future developments. *Energy Policy*, *39*(10), 6040–6054, at pp. 6052.

system reform as well as innovations of a range of green finance trading products, both of which would support a healthy operation of the carbon market by improving the price transmission mechanism of China's emerging green finance market. Shenzhen is even about to launch China's first pilot of central bank's Digital Currency/Electronic Payment (DC/EP). This is just one example of China's brave policy pilots where "laws are framed as reversible and temporary"[205]. China's various pilot programs would promote constructive dialogues between program owners, local competent authorities, and higher-level policymakers on "evidence about what works"[206], without putting too much efforts on setting the metric for program success at demonstrating an undoubtedly positive impact on end outcomes, as well as endless ex-ante hearings which might over-score the methods, values, or agendas advanced by quality evidence on the performance of law and policy in the first place.

In addition to making aggressive contributions on supporting evolution of the law by testing legal theories and assumptions "bottom-up", China's policy pilots can further reduce the administrative and sunk costs of launching new policy or program initiatives nationwide. Taking advantage of experimenting trial policies or programs on a subset of regulated entities but not all, the competent authorities and program leaders can therefore take bolder steps knowing that the possible market chaos or capacity waste of their pilot programs are and will be limited to a relatively smaller scale.

Here, the right balance between brave innovation and cautious practice can be very complex. President Xi described it as "galloping with steady steps"[207] when referring to China's industrial upgrading and legal reform, as opposed to the previous slogan of "vacating the cage in order to change the bird"[208] few years ago, with the latter representing a rougher approach. Yet, the standard or criteria defining "steady steps" remains unclear.

b. Flexibility and local experimentation

Fragmented regional pilot programs have relatively more flexibility in complying with the set environmental regulations. Different regional pilot programs with different economic structures can share their best practices and provide valuable information and lessons about what kinds of adjustments and improvements are needed, which might lead to the right direction to implement a certain as-yet-untested pilot program to the entire country given a relatively short period of time. Comprehensive evaluation programs would slow the whole process down.

On the other hand, experience generated from these local environmental policy pilots or programs may also be useful informing law and policy by showing that certain complementary climate mitigation measures are needed or do not work out well. In the local experimental phase, the rules that effect policy variation on a temporary basis are mostly flexible enough to not be covered by a national ban of certain procedures or trading products. A lot of times, some market participants have

---

[205] Chien, C. V. (2018). Rigorous Policy Pilots: Experimentation in the Administration of the Law. *Iowa Law Review*. Retrieved from https://heinonline.org/hol-cgi-bin/get_pdf.cgi?handle=hein.journals/ilr104&section=63

[206] Ibid.

[207] *蹄疾步稳*

[208] *腾笼换鸟*

been doing such practices informally in the regional pilots until their practices get formalized by official documents released by their competent authorities.

Here, this dissertation does not advocate for further expansion of new pilot programs in China. However, the efforts of these local experimentations should be considered an important step forward to tackle the intractable climate change. Both in succeeding and failing, these pilots will bring benefits not only for China but will allow other countries to share its experience in the national and international efforts to fight global warming.

3. Bridging Shenzhen and California

There may well be positive benefits of China's various environmental pilot programs, however, certain design and implementation choices of China's policy pilots will also limit learning and impede prospects of "bottom-up" innovation. Environmental program and policy effectiveness depend on at least seven features of a government policy: incentives, rationality, information generation, adaptability, credibility, management, and budget.[209] It seems clear that China's environmental pilot programs are not sufficient by themselves, but it is less clear why we need to seek environmental program evaluation and just how much supplementation is required.

This work now turns to the practice of California carbon market, hoping to seek new tools for advancing the design and implementation of China's environmental policy and programs.

Both California and Shenzhen have been very active players in climate change and have the earliest carbon market in their countries, except the former began its cap-and-trade program well before any significant federal involvement while the latter launched its carbon trading pilot in response to a national call from the central government. As for economic structure, both California and Shenzhen are known for their high-tech industries, growing service industries and increasing GHG emissions from the transport, residential and commercial sectors. It might even be possible in the future to link the two carbon trading markets given that they share similar levels of ambition, timeline, compliance and enforcement standards, and allowance allocation methods with respect to capping emissions.[210].

II. Part Two: Observations on the California Climate Bill - Assembly Bill 32 (AB 32)

CALIFORNIA AB 32 AND ITS EVALUATION PROGRAMS

1. Summary of California AB 32

California AB 32, or the California Global Warming Solutions Act, was a multi-year program signed into law by Governor Arnold Schwarzenegger on September 27, 2006. This law is the first comprehensive climate bill in California, and it has drawn world-wide attention as a landmark program of regulatory and market mechanisms with a binding GHG emissions target. Under AB 32, California is required to reduce statewide emissions to the 1990 level by 2020, and to make deeper reductions by 2050.

---

[209] Schuck, P. H. (2014). *Why Government Fails So Often: And How It Can Do Better*. Princeton University Press.

[210] Perdan, S., & Azapagic, A., no. 204 above, at pp. 6048.

According to AB 32 legislation, the California Air Resources Board (CARB) is the lead agency responsible for the implementation of a series clean energy policies targeted at increasing energy efficiency in homes, buildings, and vehicles; cleaner transportation fuels; increasing reliance on renewable energy; and reducing carbon pollution.[211] The CARB quickly developed nine "discrete early action GHG emission reduction measures"[212] and later established the more notable California cap-and-trade program. AB 32 also requires the CARB to evaluate a bunch of factors, including California's economy, environment and public health, equity between regulated entities, electricity reliability, and conformance with other environmental laws.[213]

The CARB together with the Climate Action Team, created the AB 32 Scoping Plan in December 2008 which described the approach California would take to reduce GHG, and approved the First Update to the Climate Change Scoping Plan in May 2014. In 2016, the Legislature passed Senate Bill 32 (SB 32) which codifies a 2030 GHG emissions reduction target of 40 percent below 1990 levels.[214] Moving forward, the CARB came up with a second update to the Scoping Plan in November 2017 to reflect this 2030 target.

However, AB 32 is much more than the trading system supervised by the CARB. A government list of agencies implementing AB 32 and a barrage of their complementary climate mitigation measures[215] indicate that California has moved well beyond the traditional approach in which environmental agency imposes numerical limits and restrictions on high-emission industries. Instead, California's climate mitigation measures have involved many different aspects of life, covering everything from individual's choice of cooking range to government's long-term strategic urban planning.

Moreover, emissions reductions and the associated health benefits should be targeted to communities where they are needed most, where climate change impacts are often disproportionately transferred to. Particularly, in California's most vulnerable and disadvantaged populations, low-income communities, and low-income households. Senate Bill 535 and Assembly Bill 1550 directed that at least 25 percent of funds received from the GHG Reduction Fund go to projects located within and benefiting disadvantaged communities and at least an additional ten percent is for low-income households or communities.[216]

2. Advisory groups of the California AB 32

California's GHG mitigation policies arise from AB 32 have far reaching economic

---

[211] Climate Change Controversy in California: A Summary of California Climate Bill AB 32 and Ballot Proposition 23 (Part I of II) - Ecometrica. (2010, September 16). Retrieved December 2, 2019, from Ecometrica website: https://ecometrica.com/article/climate_change_controversy_in_california_part_i

[212] Early Action Items | California Air Resources Board. (n.d.). Retrieved December 8, 2019, from https://ww3.arb.ca.gov/cc/ccea/ccea.htm.

[213] Climate Change Controversy in California: A Summary of California Climate Bill AB 32 and Ballot Proposition 23 (Part I of II), no. 211 above.

[214] California Air Resources Board. (n.d.). Scoping Plan | California Air Resources Board. Retrieved December 8, 2019, from https://ww3.arb.ca.gov/cc/scopingplan/scopingplan.htm

[215] Farber, D. A. (2015). California Climate Law-Model or Object Lesson. *Pace Envtl. L. Rev.*, *32*, 492-500, at pp. 495, 496.

[216] California Climate Investments to Benefit Disadvantaged Communities – CalEPA. Retrieved December 2, 2019, from https://calepa.ca.gov/EnvJustice/GHGInvest/.

consequences which affect the livelihoods of California households. The significant controversy surrounding the economic impacts of AB 32[217] is absolutely not alone to the debate. Therefore, it's worth noting two advisory groups of AB 32 – the Economic and Allocation Advisory Committee (EAAC)[218], and the Environmental Justice Advisory Committee (EJAC). Both committees comprises economic, financial, and policy experts with expertise in issues of energy and climate in California, who worked closely with the CARB to refine methodologies, socially effectiveness, and environmental justice of AB 32 and help inform measure-specific analysis such as the California cap-and-trade regulation.[219]

3. External evaluators affiliated with the University of California or California State University systems

The CARB has prioritized the funding of research whose findings are relevant for designing AB 32's carbon mitigation regulations and evaluating these regulations' impact on the California economy, from evaluators affiliated with the University of California or California State University systems.[220] For example, the UC Davis Report to the Strategic Growth Council[221]: Evaluation of the Technical Assistance Pilot for the Affordable Housing and Sustainable Communities Grant Program, and the Berkeley Energy and Resource (BEAR) project.

WHY DOES CHINA NEED TO SEEK ENVIRONMENTAL PROGRAM EVALUATION?

From the first chapter, we learnt that China's climate governance and energy regulatory system are fragmented, where authority is shared by a number of influential bodies, which has produced opposition and frequent delays. This complex climate governance and energy regulatory system has provided chance for environmental program evaluation to develop and grow in China as an important part of its administrative law reform. Industry claims about the effects of proposed rules often seem reflexive, poorly supported, and lacking in credibility. Using environmental program evaluation as part of agencies' regulatory process and implementation would add to relevant authorities and entities' ability to foresee and measure those costs and risks before the policy is fully elaborated and implemented. Evaluation programs are also crucial for building connectivity between different programs and competent authorities.

As illustrated in chapter two of this dissertation, the benefits of environmental

---

[217] A list of supporters and objectors of AB 32 and its impacts on the California economy is provided at: Climate Change Controversy in California: A Summary of California Climate Bill AB 32 and Ballot Proposition 23 (Part I of II), no. 211 above.

[218] California Energy Commission. (n.d.). Economic and Allocation Advisory Committee - California Climate Change. Retrieved December 8, 2019, from https://www.climatechange.ca.gov/eaac/.

[219] The Economic and Technology Advancement Advisory Committee (ETAAC) of the CARB is more technical-oriented, thus omitted here.

[220] California Air Resources Board. (n.d.). AB 32 Economic Analysis, no. 214 above.

[221] A cabinet level committee that is tasked with coordinating the activities of state agencies to: improve air and water quality; protect natural resources and agriculture lands; increase the availability of affordable housing; promote public health and equity; improve transportation; encourage greater infill and compact development; strengthen the economy; promote water conservation; revitalize community and urban centers; assist state and local entities in the planning of sustainable communities and meeting AB 32 goals; advance the priorities developed in Safeguarding California, the State's climate adaptation strategy.

policies and programs do not produce immediate results. According to government documents, the metrics of China's major environmental and energy programs are described as "a courage, an audacity, a strategic insight, and an attitude of historical responsibility"[222] which cannot be quantified. The diverse program evaluation methods, especially process evaluation and institutional evaluation, can serve well as important complements for better understanding and describing agency agenda and program activities, and provide tools for advancing environmental policy stability, rather than being mired in bureaucratic tussles due to lack of standards.

Here, it is important to look forward at prospects for applying these findings of the previous chapters to China's pilot programs and ask whether China's environmental field would be appropriate for environmental program evaluation to develop and grow, just as important is to look back at the similarities and differences in our Shenzhen case and California AB 32 and ask why does China need to look to environmental program evaluation theory and try to introduce it to China.

First, the climate mitigation policy package and levels of ambition with respect to environmental objectives in Shenzhen were similar to that of California, except for a time lag of nine to ten years partly due to their economic growth. Both regions have committed to cap emissions with comparable units and have been actively exploring possible interventions or climate treatment options, implemented by a various of regulatory agencies. In the long run, environmental policies in Shenzhen and California have been converging. Shenzhen, however, has had to address many environmental issues which took up to 60 years for California to resolve within a relatively short period.

Second, even though the details were different in each case, both ETS programs in Shenzhen and California have a similar timeline of operation and number of ETS-covered sectors and enterprises, and have both faced pressures from their own countries and worldwide. economic growth. Both carbon markets have served as important study cases for latecomers.

Third, when compared to California, the tempo of carbon market development in Shenzhen has been slower due to several factors. Local government of Shenzhen in particular has played only a small role in the field of environmental policy, and the level of environmental information disclosure and public participation was more limited than in California. Moreover, market mechanism in Shenzhen were weaker than in California, which has caused less measures and support groups for energy conservation and pollution control.

Lastly, without systematic environmental program evaluations, Shenzhen has failed to assess linkages between its environmental policies and programs, and improvement of quality of people's life, as well as cost of program failure on enterprises and minority groups. The regulatory philosophy of "looking at the bright side" has diminished Shenzhen's ability of learning the lessons from the failure of other programs.

This chapter argues that without procedurally adequate and well-controlled practice, the information and experience generating function and innovative

[222] *张国宝. (2018). 筚路蓝缕: 世纪工程决策建设记述. 人民出版社.*

potential of China's policy pilots will end up with formalistic and meaningless redundancy. That is, without well designed, well implemented and well controlled evaluation programs, the value of China's various policy pilots as a learning exercises can be greatly reduced. As the standards of defining success, failure, and in between are not clear, so are the impacts of China's ambitious climate-related campaign programs on the disadvantaged populations and low-income communities and households, as well as criteria for a steadier approach of achieving China's climate goals.

III. Part Three: Some other implications from a comparative and transnational perspective

Both for legal and environmental reasons, it has become necessary to consider any type of national programs from a comparative and transnational perspective since climate changes and legal responses to its challenges are not and cannot be limited by countries' national frontiers. We should not however confuse international law initiatives with comparative legal perspectives. The first ones, for example, environmental impact assessment (EIA, discussed in Chapter 2) and global environmental law, aim at channeling a common global awareness and commitment, but the comparative perspective focuses on more practical and thus enforceable policies that are more adapted to the countries' specific needs in this regard. This dissertation argues that simple direct "transplants" of international systems or measures like EIA are by themselves not enough and therefore we need more explicit and effective ways of embedding environmental considerations into a wide range of government actions and mobilizing different levels of government and many kinds of government agencies, which lead to necessary changes required for the foreign system to work out in China.

In the previous sections of this chapter, we examined the question of why China needs to bring in the theoretical tools of program evaluation to bear on the substantive concerns of environmental policy. Before going into details about China's existing environmental program evaluation approaches, this dissertation now turn to the question of how program evaluation theory can help bridging environmental programs both inside of China and worldwide, and how it is going to fit in China's own legal system and culture setting.

CREATING CONNECTIVITY

China's ability to create effective programs has broader significance beyond the country itself, partly because of the global significance of Chinese emissions. Transnational partners, whether at the UNFCCC level or at the subnational level, will not find it worthwhile to cooperate with China unless China can find ways to make its programs effective in practice. Further, other emerging economies face similar challenges in policy implementation, making the lessons from studying China more broadly relevant.

1. China's growing population and emission caps

China's emissions caps are still expected to be on the climbing arcs in the next

decade, which is also the case with India whose populations are also expected to grow. Moreover, both countries' legal systems embrace mixed jurisdiction with foreign law transplants. How do China and India respond politically to environmental problems around the globe? Answering this question requires systematic, cross-national comparisons and evaluations of political institutions, regulatory styles, and state-society relations. More importantly, China's ability to improve the effectiveness of its climate governance system will serve as a positive case for the whole world.

2. China's role as a developing country and China's "Belt and Road" Initiative

The more people see serious pollution emissions as an entitlement for developing countries, the more appealing it becomes to relocate serious polluting production to areas with less jobs and low tax revenues. This creates a disadvantage for disadvantaged communities, without the benefit of reducing pollutants that contribute to overall global warming impacts. This is also the case where developed countries relocating their high-pollution production to developing countries to reduce emissions.

With China's role as a developing country tackling climate change, and its "Belt and Road" Initiative covering mostly developing regions in India, Mesopotamia, Northern Africa, and Europe, it is important that China start to work on creating more effective cross-border programs in order to invest more wisely and discreetly.

3. International communication and cooperation between subnational regions

Vice versa, with China's market-based reform attracting more and more foreign direct investments (FDI) and international cooperation, detailed implementation mechanism, evaluation framework, and measurement standards, tools, and strategies will boost climate actions through international communication and cooperation.

DISTINGUISH CHINESE CHARASTERISTICS AND NON-CHINESE CHARASTERISTCS

1. Important things to consider that are not Chinese Characteristics

Some important considerations that are universal to climate change legislation are addressed below:

a. Local resistance facing economic downturn

"While energy efficiency improvements are often cost-effective in the long run, challenges to adoption and implementation include high initial costs, budgetary and debt constraints, and split incentives in multitenant properties between those who pay for improvements and those who receive the benefits."[223] The combination of the growing nationwide electricity, fuel, and natural gas consumption needs add to economic uncertainties which could raise serious doubts about the cost-benefit of the current climate mitigation policy package and the extra procedural or substantive burdens of immediate compliance obligations.[224]

[223] Farber, D. A. (2015). California Climate Law-Model or Object Lesson. *Pace Envtl. L. Rev.*, *32*, 492-500, note 18, at pp. 496.

[224] Two difficulties on the benefit side of the cost-benefit analysis (CBA) are provided at: Farber, D. A. (2019). Regulatory Review in Anti-Regulatory Times. *Chi. -Kent L. Rev.*, *94*, 383-437, at pp. 388.

b. Market expectation and market instruments' impact on individual and organizational behavior

In our Shenzhen ETS case, how to effectively guide market expectation is a great challenge because of its intensity-based emission cap. In a mature market economy, both sides of demand and supply should be stimulated effectively in order to promote regular allowance trading or allowance transfer through agreed deals. However, the EU ETS spot market does not attract investment from the general public[225], especially the uninformed retail customers of natural gas, fuel, and electricity. Individual buyers or communities do not have too much choices facing big energy companies, and price signals in the carbon market and the energy sector may not be appealing enough to coordinate the needed behavioral responses that are both rational and collective.[226]

Here, program evaluation can serve as a crucial measure for increasing transparency, investor protection, and thus overall market participation, as it puts individuals as clients of government service or public programs. This dissertation argues that the various evaluation programs of the California AB 32 serve as an important tool for the public and companies[227] to better understand the long-term delayed harms and multi-generational effects of global warming. The November 2010 elections, 61 percent of Californians voted to keep AB 32 in effect, which showed the significant grassroots support for climate change legislation in California.[228]

c. Government agency capacity and reliability

Knowledge beyond economics is also important. For example, the traditional local tax collecting system in China may be used for collecting carbon and environmental taxes, whereas a tradable permits system requires new administrative departments to be set up.[229] To cite one example, as a coordination mechanism for macro affairs rather than a regulatory agency, the NDRC is not good at designing a complicated regulatory system such as the subtly designed ETS. Its poor regulatory capacity, in particular, its monitoring capacity, would therefore pose problems for the introduction of the necessary feasible rules and unified regulation systems of a nationwide ETS in China.

Also, the NDRC and MEE are in a unique position to design China's national carbon market as opposed to using legal directives to make the market work, not to mention the oversight of various proposed and existing trading products in China's environmental rights trading system.

Many countries have adopted cost-effectiveness evaluation or performance measurement programs in order to inform government agency capacity and

---

[225] Weishaar, S. E. (2016). *Research Handbook on Emissions Trading*. Edward Elgar Publishing, at pp. 225.

[226] Farber, D. A., no. 223 above, at pp. 498, 499.

[227] A list of companies, Californian organizations and individuals supporting California AB 32 is provided at: Climate Change Controversy in California: A Summary of California Climate Bill AB 32 and Ballot Proposition 23 (Part I of II), no. 211 above.

[228] Farber, D. A., no. 223 above, at pp. 494.

[229] Jin, Y., Andersson, H., & Zhang, S. (2016). Air Pollution Control Policies in China: A Retrospective and Prospects. *International Journal of Environmental Research and Public Health*, *13*(12). https://doi.org/10.3390/ijerph13121219

reliability. However, process evaluations of agency activities might provide us more information needed for agency agenda control.

d. An ultimate climate mitigation policy package, an optimal carbon price, and a perfect allocation of environmental resources

Even in mature market economies like the U.S. and the EU, there have been debates about which climate mitigation interventions to choose, what carbon price to set, and how to make sure resources, quotas, permits, or subsidies are allocated effectively. The main obstacles of reaching the answers of these questions are never purely technical or limited to a particular country.

e. Government reorganization

As mentioned in Chapter 1, starting March 2018, a great portion of responsibility for climate governance, including the regulatory of the national carbon market, was transferred from the NDRC to the newly formed MEE. This had slowed down the implementation of China's national carbon market and its supporting systems. However, better-integrated government institutions can be advantageous to unify rulemaking and thus better efficiency. We shall see in the future whether the reshuffle of China's climate governance agencies can lead to smoother operation of China's national carbon market.

In order to combat climate change, we need much more than retroactive short-term actions. Energy efficiency and GHG reduction goals require "long-term strategic planning to eliminate persistent market barriers and effect lasting transformation in the market across the economy"[230]. Greater political predictability is necessary for encouraging long-term investment in emission reduction, as people need to make sure that political will to continue making investments in the environmental protection field.

However, as the Trump Administration has eliminated over twenty major regulations on issues such as climate change[231], both the national and international efforts of tackling climate change and the much needed long-term strategic planning clearly will have to face up with many challenges including government transition, department reorganization, government officials election, in the US, China, and worldwide. A good research topic here would be a comparative study of China's Five-Year-Plans (FYPs) of the electricity sector and renewable energy industry and the California AB 32 Scoping plan. It is also worth examining the relatively more stable political support of climate change actions in California before and after the 2020 presidential election.

2. China's footprint

It is worth writing another or a few more dissertations about China's unique social structure and governing system with China's special characteristics. Two of important considerations related to climate governance and pilot projects are illustrated below:

a. China's tradition to green-light top-priority tasks

China's ability to mobilize businesses, organizations, and individual forces to

[230] Farber, D. A., no. 223 above, at pp. 498, 499.

[231] Farber, D. A. (2019). Regulatory Review in Anti-Regulatory Times. *Chi. -Kent L. Rev.*, *94*, 383-437, at pp. 384.

work towards integrated "top mission" is unique and needs to be evaluated for beyond current efforts, to support China's aggressive energy efficiency and global warming goals.

In November 2018 and November 2019, China's Ministry of Finance issued in advance full amount of special funds of poverty alleviation for the next year, despite the economic stress and capital constraints which both central and local government have faced up with in recent years. This is just an example of China's tradition of setting aside a certain amount of budget and administrative and human capacity in order to tackle the primary task.[232]

China's democratic centralism system might not be able to eliminate political gridlock, but it does have China's special characteristics implications, that is, to move China's governmental authorities towards the same direction appointed by China's top leaders, and to only reserve dissents regarding to implementation details, credits allocation, and competent jurisdiction of a certain proposed policy or program initiative. A good comparison here would be China's South Water to North Project and the California State Water Project (SWP), which might generate some interesting and useful results.

Most of times, pilot programs or demonstrations are considered as a "green light" signal with little restrictions in China, as the government has not identified a single pilot program or demonstration project as failure. However, even the most ideal policy design cannot replace lessons learned from some spectacular homegrown mistakes in the real world. Without program evaluation to define policy success, failure, and in between, the exchange of information by holding expert meetings itself may only add to sunk costs that each pilot invests in facilities for its own trading scheme if they are not consistent with national ones and will have to be eliminated as a national program starts operating[233]. Once the government has shifted their focus and priority towards the next "big project", impacts of these policy pilots' on the minority group would become unpredictable.

b. Free trade and government supervision

Traditionally, because of China's history of its centrally planned economy, China has almost no or very little experience in market-oriented instruments and lack of human capacity. Three decades of economic reforms have shifted the role of the competent authorities from a market dominator to a market regulator and created this so-called "significant freedom" within strong supervisory and proper macro-control, which can be very different from a mature market economy.

For example, suppose a distributor wants to buy ten bottles of liquor from Kweichow Moutai Co., China's largest liquor maker based in Guizhou Province, the distributor would need to buy fresh produce from poverty-stricken area in Guizhou of 5000 RMB value at the same time, for poverty alleviation purpose, according to local government policies. Here, local governments are in a unique position tying the popular Moutai liquor with local fresh produce as a bundle.

Two of the most similar efforts here would be the restrict issuance of new car

---

[232] *集中力量办大事*

[233] Zhang, Z., no. 200 above.

licenses with exception of new energy vehicles (NEVs) and the carbon trading market covering both direct emissions and indirect emissions from purchased electricity, heat or steam. The regulatory philosophy behind these tying arrangements is that when consumers purchase a certain product with short supply – an extra vehicle in the busiest cities of China, they will need to pay extra for things that are considered "socially beneficial" by the government.

However, while it might be workable to impose government will on products such as a bottle of liquor or an extra car, it is not reasonable to add such mandates and bans on products closely related to people's daily needs – electricity, as we discussed in chapter one of this dissertation. Meanwhile, compliance companies might react to the traditional legal directives quickly, but they might be hesitant and not confident enough to trade without official documents and sound legal basis.

Another example is the less-reaching jurisdiction of China's local government while reserving broad discretion for China's state-owned enterprises (SOEs). State government in the US has broad jurisdiction but numerous corresponding evaluation programs in order to ensure government countability and policy effectiveness. The less-reaching jurisdiction of China's local government has given birth to the "wild west" style local policy pilots and experimental programs as a way of enabling local action. On the contrary, China's big SOEs have held advantages on the country's resources, experts with year of experience designing and then implementing big environmental and energy projects, and bargaining power, but only minimal constraints from "checks and balances". When newly added evaluations are internal and grounded in the lived experiences of those required to implement them, the SOEs may be more able to withstand such transitions. However, in the long run, third-party evaluations are vital in order to check whether the interests of China's SOEs truly represent the interests of the people. It is also important to offer a chance for those SOEs' external consultants to transform to independent third-party evaluators.

IV. Conclusion - an environmental program evaluation system that is dependent on China's own culture setting.

This chapter calls for embracing environmental program evaluation theory into China's legal system which comprises rules, concepts, structures, and legal institutions that can be seen as China's special characteristics. In particular, it will be of great comparative interest to see how the operational and reporting prerequisites needed for conducting environmental program evaluation feature within the Chinese environment, in order to link fragmented regional carbon markets and trade allowances across regions, and thus to ensure that a nationwide carbon emissions trading scheme functions properly in China.

To that end, an environmental program evaluation system needs to be established in an aim to identify shortages based on past pilots, make adjustments to current pilots, and launch new pilots with evaluation programs; to generate economically valuable and environmentally credible reductions[234]; and to advance

[234] Zhang, Z., no. 200 above.

united policy-making process, guidelines and methodologies that is rule antecedence.

Chapter 4 The Role of Program Evaluation in China's Environmental Policy and Program within Government

There are important reasons to target the use of program evaluation in China's environmental policy arena. The idea of evaluating government programs is a relatively new and ticklish idea to China's government and public policymakers. There appears to be a disconnect between what would pass for environmental program evaluation in theory and what would pass for environmental program evaluation on the ground within China's environmental regulatory agencies. In part, it is a perceived disconnect that many government policies and programs continued to be evaluated based on completion of administrative processes rather than on attainment of performance.[235] But there is some evidence that China's environmental regulatory agencies lag behind other countries in the transparency of conducting and using program evaluation overall. A recent report[236] by China's National Audit Office highlights difficulties in measuring resource development, ecological protection, and pollution control results, as well as issues in developing rules to track the management and performance of the use of special funds for China's environmental programs including various pilot projects along the Yangtze River.

One aspect of this chapter is to look beyond specific issues of environmental pilot projects - such as the role the initial allocation of emission permits has for later market outcomes, to the more general, but important underlying question of how program evaluations and the knowledge they reflect find their way into China's environmental policy and programs. It argues that understanding this relationship between China's environmental program evaluation and the policy incorporation process alters the focus of research from technical policy analysis to a more wide-ranging examination of environmental policy-making itself.[237]

Another aspect of this chapter aims to open up to scrutiny China's environmental program evaluation through a review of all types of sources from a variety of settings and approaches, to investigate the role of environmental program evaluation in China's context with conceptual and methodological tools for further empirical research, rather than commenting on any particular environmental program or policy.

This chapter provides an opportunity to step back and look at the broader picture of an evaluation process which should be developed for China's environmental programs, and the important considerations of implementing China's climate policy. It begins by clarifying the concept of environmental program evaluation in this dissertation for the purpose of our discussion. Part 1 first review the role of program evaluation in program and policy processes. It then examines a

---

[235] Bennear, L. S., & Dickinson, K. L. (2008). The Role of Program Evaluation in Environmental Policy: A Critical Evaluation of Incentive Structures. Retrieved from http://people.duke.edu/~lds5/Papers/Bennear_Dickinson_GPRA_PART.pdf, at pp. 2.

[236] *审计署发布长江经济带生态环保"体检报告"-新华网. (n.d.). Retrieved December 14, 2019, from http://www.xinhuanet.com/politics/2018-06/20/c_1123009136.htm.*

[237] Keeley, J., & Scoones, I. (1999). Understanding Environmental Policy Processes: A Review. Institute of Development Studies, at pp. 3.

series of China's recent climate-related campaign programs and environmental policy innovations. Lastly, it discusses the relationship and differences between environmental program evaluation and various environmental management tools.

In order to fully understand how environmental program evaluation when applied to the context of China's recent climate governance practice, Part 2 of this chapter describes the ideological, institutional, and political context of China's environmental program evaluation. It answers two questions: 1) How does China address agencies' use of program evaluation in order to improve environmental conditions? And more importantly, 2) how do agencies respond to the set of assessments which program evaluations make? Understanding these two questions provides a helpful framework with which to understand the role China's key authorities and entities over climate and energy issues play in the aftermath of the central policy shift on environmental protection.

As a positive matter, Part 3 draws upon the experiences and inspirations from China's recent policy innovations and policy trends and explains the prospects of environmental program evaluation for agency agenda control. For example, the policy shifts from focusing on up-front approvals, with most attention paid to individual EIA approval certificates and construction approvals, to corporate operational compliance and responsible oversight [238], including requirements of companies' internal environmental audits. The vital question is, how can these adjustments be improved to move government agencies and programs closer to the ideal accountability system?

I. Part One: Clarifying the Concept of Environmental Program Evaluation

To look at China's environmental program evaluation closely, it is useful first to define the role that program evaluation can play in program and policy processes, distinguishing evaluation from other types of analysis, including environmental auditing, environmental inspection, and other tools of the environmental management systems (EMSs).

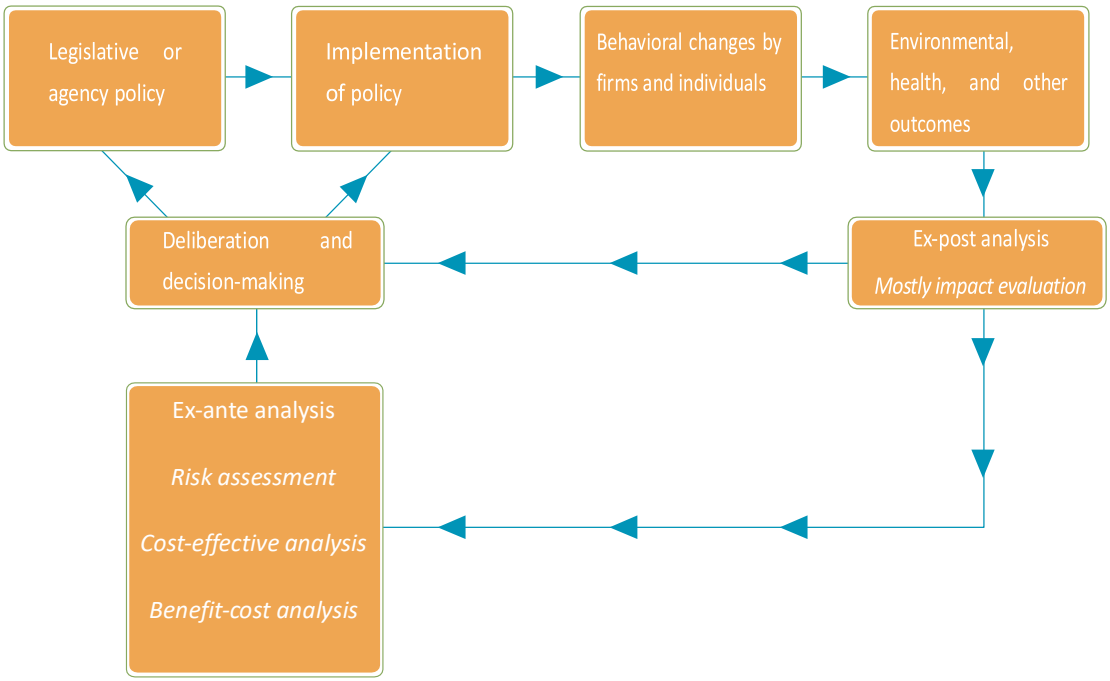
This section outlines four different evaluation designs and some of the possible roles they might serve in the program set-up stage and program going-forward stage. In so doing, it distinguishes environmental program evaluation among other types of environmental analysis or environmental management tools. Further, it argues that most of China's recent environmental campaign programs and policy innovations have embraced strict environmental enforcements, environmental auditing and environmental inspections. They may have achieved some good progress improving environmental and agency performance, but a normative review of relevant cases suggests that the relationships between this China's latest anti-pollution drive and discovering the effectiveness of climate mitigation interventions are ambiguous and fogged.

UNDERSTANDING THE ROLE OF PROGRAM EVALUATION IN PROGRAM AND POLICY

[238] Corne, P., & Johnny Browaeys, The Diplomat. (n.d.). China Cleans up Its Act on Environmental Enforcement. Retrieved August 20, 2019, from The Diplomat website: https://thediplomat.com/2017/12/china-cleans-up-its-act-on-environmental-enforcement/.

PROCESSES

Environmental programs can be evaluated via impact, (early) planning, process, and efficiency designs, and therefore environmental program evaluations can be undertaken at specific points in the policy and program cycle, which involves preparation and negotiation in the stage of program set-up, as well as implementation and revision in the stage of program going-forward.[239] A basic model of how program evaluation research fits into the program and policy design processes and serves an important role in environmental decision-making is diagramed in Figure 4.1 below. This chapter's goal is not to provide a comprehensive review of the policy process, but to point to the role of program evaluation that may provide useful conceptual and methodological tools for investigating environmental policy processes in China's contexts.



Source: L. S. Bennear and C. Coglianese, 2004

Figure 4.1 Program evaluation in the policy design cycle

Although some environmental program evaluation studies have taken the narrow approach when defining program evaluation, that is, to define program evaluation as retrospective analysis (ex-post analysis) only, distinguishing evaluation from evaluability assessment, needs assessment, logic model, performance measurement, risk assessment and other forms of economic assessments of costs and benefits, this thesis takes the broad approach. This dissertation argues that such approach is based on a narrow performance-focused approach of improving government effectiveness; that prospective analysis (ex-ante analysis) of environmental policy should also serve as an important link of environmental program evaluation system. Because formative evaluation, process evaluation and efficiency evaluation designs are shown to be

[239] Knaap, G. J., Kim, T. J., & Kim, T. (1998). Environmental Program Evaluation: A Primer. University of Illinois Press, at pp. 9.

highly relevant to successful policy and effective program implementation from an evidence-based point of view[240], especially in terms of environment. Moreover, these different evaluation designs are not always separated. For example, impact evaluation, efficiency evaluation and process evaluation mark the end of one cycle of policy design, but they can also mark the beginning of the next cycle of the results of the evaluation are used to learn about the effectiveness of different policy options and inform future choices.[241]

Table 4.1 outlines how the four different evaluation designs (impact evaluation, formative evaluation, process evaluation and efficiency evaluation) fit into program set-up and program going-forward stage in more detail. This section outlines some of the possible roles environmental program evaluation might serve in the program set-up stage and program going-forward stage.

Program Stage	Impact Evaluation	Formative Evaluation	Process Evaluation	Efficiency Evaluation
Program Set-up	Might be needed in the long run; Check the potential of a program to deliver benefits from proposed interventions	Acquire information that assists with early program improvement	Often considered as internal agency business	Risk assessment; Cost-effective analysis; Benefit-cost analysis
Program Going-forward	Ex-post analysis of various environmental indicators to show which intervention(s) will get the job done at the least cost or disruption to society	Adjust and enhance existing new programs' service in their early stages	Program monitoring; Program description function	Provide individuals or organizations with information to make better decisions in the future

Table 4.1 The role of four different evaluation designs in program stages

First, for impact evaluation, environmental indicators are used to study environmental program impacts instead of the traditional outcome evaluation approach, which provide a fundamental feedback loop that is essential from the point of performance-based system[242]. However, questions remain for analysts and evaluators to address whether the identification of such impacts can lead to better environmental policies in the long run. Additionally, ex-ante impact evaluation also serves as a planning tool which provides explicit information of how the intervention will achieve its results, contributes to the operational plan and supports the design of the overall evaluation system.[243] For example, a solar PV poverty alleviation program

[240] A thorough examination of performance-based and evidence-based movements of improving government effectiveness has been done by Carolyn J. Heinrich in 2007.

[241] Bennear, L. S., & Dickinson, K. L., no. 235 above, at pp. 5.

[242] Id. at pp. 7.

[243] Detail guides for ex-ante impact evaluation including framework and steps are provided at Crissman, C., Abernethy, K., Delaporte, A., & Timmers, B. (2013). A practical guide for ex-ante impact evaluation in fisheries and aquaculture. AAS-2013-04, 23.

proposal may highlight whether it receives any priority in relevance to the development and environmental settings as well as the national strategies and plans.[244] Again, it helps to know that ex-ante impact evaluations must not be confused with Environmental Impact Assessments (EIAs).

Second, the purpose of formative evaluations is to adjust and enhance existing new interventions or programs' services provided by agencies as they are evolving, without looking to see whether the final result of certain policy or program is worth the funding it receives. In particular, in the program set-up stage, existing program(s) can be studied while being modified or being used in a new setting or with a new target population. This can help to determine whether a new or pilot program has treatment fidelity (in other words, *workable*) or whether an existing pilot program is *replicable*. In our case, evaluations of this kind often exist in the form of locating model standards, getting expert consultation, and forming an ad hoc evaluation committee in China's practice of implementing new climate change mitigations.

Third, process evaluations, on the other hand, helps to make sure program activities are effective once programs are little older and more established. Here, we must bear in mind that evaluators must look beyond the simple administrative-indicators methodology or time consuming, more "bean counting" of a process evaluation which takes away from "real" work. Typically, in the stage of program set-up, process evaluations tell people what the program or policy plans to do, or in the case of carbon market, the program activities or the process objectives such as planning to cover which sector(s) by when, not why or how these interventions will make a difference. "It is evident that not having a clear understanding of what the program could or could not do was leading to unrealistic expectations."[245] Moreover, in the stage of program going-forward or even at the end of a program, process evaluations are often required for program monitoring or program description function in order to inform others about what they might expect if they were to replicate a similar program or to transfer the knowledge and technology from the program, and to use that information to guide programs tomorrow and thereafter. Process evaluations in both stages are certainly worth considering given China's various demonstration policies, demonstration zones, and demonstration projects in the environmental field.

It is worth mentioning that institutional evaluation can go even broader than process evaluation, by looking beyond short-term measures of policy success and failure and ask out long-term changes in institutional behavior. Like process evaluation and formative evaluation, institutional evaluation also tends to be more descriptive and its focus is not on measurement of program outcomes or impacts. In such case, program evaluations often serve instrumental or enlightenment functions - the former help to provide information that contributes to decisions that shape program goals, strategic plans, and actions; the latter help to increase general understanding of program operations, underlying assumptions, or social context by

[244] In this case and in today's China, yes. More to discuss in part 3.

[245] Clarke, C. A., & Fox, S. P. (2006). Grant Proposal Makeover: Transform Your Request from No to Yes. John Wiley & Sons.

communicating program goals, accomplishments, and evaluation findings to external audiences[246]. Regrettably, institutional variables, particularly long-term institutional change, although so clearly merit attention, are always intentionally put aside by in-house policy and program evaluators of government agencies. Unlike impacts evaluation, both process evaluation and institutional evaluation give more attention to contested standards, disagreement or confusion over program goals and objectives, and institutional capacities for program implementation.[247]

Last, efficiency evaluations, while being considered as "too much trouble"[248] from China's practice with government-invested projects over years, are crucial in both program set-up and going-forward stages. For example, the 80 years old Guangzhou Electric Power Station experienced a "Super Clean Renovation" from 2014-2015 and was determined "clean" by the relevant environmental protection department in 2016. However, under the newly launched "Guangdong Province Blue Sky 2018 Action Plan", it will be shut down entirely together with its 92.5-kilowatt coal-fired units by the end of 2018[249]. Efficiency evaluations should be introduced both in the program set-up and going-forward stages to avoid such waste of government funds and resources, and to come up with better treatment options in the future.

DISTINGUISHING ENVIRONMENTAL PROGRAM EVALUATION FROM ENVIRONMENTAL AUDITING AND ENVIRONMENTAL INSPECTION (all in the summative stage)

A variety of anti-pollution and environmental clean-up actions and many campaign programs in various environmental fields have been taken up recently in China since it declared war on pollution four years ago. For example, the Central Environmental Protection Inspections and the follow-up "Look Back" Inspection[250] programs led by the newly established Ministry of Ecology and Environment (MEE); the 2013 five-year Action Plan on Prevention and Control of Air pollution and the brand new three-year Action Plan for Defending Blue Sky followed by a series of air pollution inspections and beefed-up air pollution inspections; the post-term natural resource assets audit for senior officials; as well as various special inspection campaigns organized to promote clean energy and to supervise energy conservation and emissions reduction efforts. (For descriptions of these campaign programs and other recent environmental policy innovations, see Table 4.2).

The Central Environmental Protection Inspection Campaign

China's Central Environmental Protection Inspection (CEPI) was legislated in 2015 and first launched in early 2016 after 5 months of pilot period. It is led by the Ministry of Environmental Protection (MEP) – which has been incorporated into the Ministry of Ecology and Environment (MEE) in 2018 and carried out by

[246] Weiss, C. H. (1977). Research for Policy's Sake: The Enlightenment Function of Social Research. Policy Analysis, 3(4), 531–545.

[247] Knaap, G. J., Kim, T. J., & Kim, T., no. 239 above, at pp. 310.

[248] Original resource in Chinese, retrieved from: http://www.qstheory.cn/zoology/2016-11/08/c_1119871328.htm.

[249] Original resource in Chinese, retrieved from: http://mp.weixin.qq.com/s/pDGiE1t7yC3q-70uvC9oLA.

[250] *中央环保督察"回头看"*

dispatched CEPI teams. After rounds of nationwide sweeping crackdown against environmental violations, in 2018, new rounds of "look back" (revisit) inspections began, making CEPI a new long-term mechanism or "New Normal" rather than a short-term action.

Pollution inspection campaigns against environmental violations

Aside from the CEPI, special air pollution, water pollution, and soil pollution prevention and control inspections were launched targeting key regions and fields troubled with heavy pollution. They are conducted by the MEE and local environmental departments or ones affiliated with the MEE. The inspection campaigns focus on poorly managed small enterprises and urban areas, including boilers, surface mines, black, foul-smelling bodies of water, as well as drinking water resources protection in the Jing-Jin-Ji region (Beijing-Tianjin-Hebei BTH triangle), Henan Province, Fenhe and Weihe river valleys and Yangtze River Delta area. Local leaders are pressured to force local factories to comply or face stiff fines and penalties. These may include daily fines, cancellation of business licenses, and even criminal enforcement.

The inspections, both CEPIs and pollution inspections, represent a new paradigm in China's environmental enforcement, backed by laws with teeth, new legal and administrative infrastructure, and policy support form the highest level,[251] but sometimes with unwanted consequences. For example, air pollution inspections in the Jing-Jin-Ji region are carried out every year closely after the release of the annual Jing-Jin-Ji autumn and winter air pollution battle plan. Yet as overzealous local officials converted coal-generated heating to gas or electric heating without enough supply of gas, millions of people were left without proper heating during freezing winter season.

2013 Clean Air Campaign; 2018 Blue Sky Protection Campaign

China's State Council issued the five-year Action Plan of Prevention and Control of Air pollution in 2013, dubbed the "Air Ten". It outlined key measures to be implemented and serves as a guideline for the national efforts to prevent and control air pollution with PM2.5 as main control target. In 2018, the new "Air Ten" – Three-year Action Plan for Defending Blue Sky was announced, followed by the beefed-up air pollution inspections. The new "Air Ten" highlights the prevent and control of VOCs and NOx emissions. Meanwhile, demedication of drinking water sources is listed among the priorities in China's water pollution control for 2018.[252]

"Water Ten"; "Soil Ten"

China's environmental targeting was ramped up and intensified by the growth of inspection teams and stricter laws and regulations, including China's environmental policy action statements – the "Air Ten", the "Water Ten"[253], and most recently, the "Soil Ten"[254].

Energy conservation and emissions reduction campaign

[251] Corne, P., & Johnny Browaeys, no. 238 above.

[252] China to work out three-year blue sky defending plan. (n.d.). Retrieved August 20, 2019, from http://chinaplus.cri.cn/news/china/9/20180205/87015.html.

[253] China's 2015 The Action Plan of Prevention and Control of Water Pollution.

[254] China's 2016 The Action Plan of Prevention and Control of Soil Pollution.

In 2014, a campaign was organized by the National Energy Administration (NEA) to supervise energy conservation and emissions reduction efforts and enforce environmental protection laws.
Post-term Natural Resource Assets Audit for Senior Officials; Environmental audits to decide local officials' promotions; Measures for the Accountability of Party and Government Leaders for Damage to the Ecological Environment (for Trial Implementation)[255] During the past two years, China's climate governance authorities have enhanced tools but changed targeting environmental infringers - from companies to regulators. In 2017, the natural resource assets departure audit on leading cadres was announced by the National Audit Office after conducting pilot audits since 2015. The regulation stated that if negative environmental impact was found in the audit, it would be taken into consideration even after officials leave their posts. And in associated rules, the career advancement of government officials was made contingent on environmental performance. The assessment includes both environment and ecological damage and the local consumption of natural resources, which must be supervised within official duty.
Environmental Impact Assessments (EIA); Monitoring, Reporting and Verification (MRV) system Obtaining an EIA approval certificate is mandatory for all the construction projects that may have an impact on the environment. Under the amended Regulation on the Administration of the Construction Project Environmental Protection, the State Council (SC) has delegated powers to the local governments, which examines and then approves, if required criteria are met, EIA certificates, except those construction projects approved by the SC or by the departments authorized by the SC, or which across the boundaries of various regions, and any other special construction projects including nuclear facilities – these projects are under the examination and approval of the authorized environmental protection departments,[256] "and the related departments shall, according to the requirement for the parallel handling and joint appraisal and review, coordinate the decentralization of approval powers, and explore and establish a new mode featuring multiple appraisal in one, and uniform appraisal and review. The marketing process of the intermediary services shall be advanced, the industrial and regional barriers and departmental monopoly shall be broken, the interest association between intermediary service agencies and government departments shall be cut off, and an open and transparent intermediary service market shall be established."[257] Additionally, China is now working on optimizing the MRV system for its national

[255] Issued by the General Office of the Central Committee of the Communist Party of China in 2015

[256] Khan, M. I., & Chang, Y.-C. (2018). Environmental Challenges and Current Practices in China—A Thorough Analysis. Sustainability: Science Practice and Policy, 10(7), 2547, at pp. 7.

[257] Governmental resource from China CPC central committee [2016] No. 18 Opinions of the Central Committee of the Communist Party of China and the State Council on Deepening the Reform of the Investment and Financing System (2016), retrieved from: http://en.pkulaw.cn.libproxy.berkeley.edu/display.aspx?id=06747f80fc67fe6ebdfb&lib=law&SearchKeyword=&SearchCKeyword=%cd%b6%c8%da%d7%ca.

carbon trading market, with third-party verifiers.[258] A policy brief released by the Green Finance Center of Paulson Institute has outlined some detailed recommendations for the gradual establishment of a MRV system for China's greenhouse gas (GHG) emissions in the near future.

Table 4.2 Examples of China's recent environmental policies and environmental campaign programs

To put the astounding scale and speed of China's recent progress in context, some studies indicate that China's fight against pollution has already laid the foundation for dramatic improvements in the capital's air quality and extraordinary gains in public health and even life expectancy[259], while others have raised important questions about the perhaps unintended human costs and unexpected perverse effects of rushing to meet these major campaign programs' targets, claiming that they "may have been a bit too successful"[260].

According to government sources[261], many of these campaign programs, for example, the pollution inspection campaign program and the clean air campaign program, were described as "seeing a doctor", "filling in the prescription", "getting the treatment"[262]; or "getting a medical examination" and then the "medical review"[263]; moreover - the central environmental protection inspection campaign and its follow up "look back" inspections – were described as "to help local governments identify environmental problems and solve them"; making it difficult for the public to know if these were environmental program evaluation, environmental auditing, or environmental inspection. Here, we must first recognize the difference between "getting the prescription after a careful examination"[264] and actually "filling in the prescription" or "getting the treatment" – the former focuses on measuring progress and producing sound interventions (program evaluation), while the latter intends to measure the effects of certain activities against set criteria or standards, with the aim of reducing such adverse effects, and therefore will more likely lead to agency enforcement (auditing, inspection). For relationships and differences between environmental program evaluation and specific environmental management tools, see Table 4.3.

---

258 *《中国碳排放数据监测、报告与核查体系建设》政策简报_碳顾问【中国碳交易网】*. (n.d.). Retrieved August 20, 2019, from http://www.tanjiaoyi.com/article-24756-1.html.

259 Greenstone, M. (2018, March 12). Four Years After Declaring War on Pollution, China Is Winning. The New York Times. Retrieved from https://www.nytimes.com/2018/03/12/upshot/china-pollution-environment-longer-lives.html.

260 Huang, Y. (2018, January 14). Opinion. The New York Times. Retrieved from https://www.nytimes.com/2018/01/14/opinion/china-environmental-policies-wrong.html.

261 *金丹*. (n.d.). New round of pollution inspections begins - Chinadaily.com.cn. Retrieved August 20, 2019, from http://www.chinadaily.com.cn/a/201806/11/WS5b1dac89a31001b82571f2cd.html.

262 *看病，抓药*

263 *体检，复查*

264 *望闻问切，把脉开方*

Types of program assessments	Self-initiated or initiated by a third-party?	When to conduct?	Environmental Management tool?	Likely lead to agency enforcement?
Environmental Program Evaluation	Self-initiated or initiated by a third-party	Conducted when a development is already in place	Not an environmental management tool	Not likely lead to agency enforcement
Environmental Impact Assessment	Self-initiated or initiated by a third-party	Conducted in the formative stage (ex-ante)	Environmental management tool	Not likely lead to agency enforcement when self-initiated
Environmental Auditing	Self-initiated or initiated by a third-party	Conducted in the summative stage (ex-post)	Environmental management tool	Not likely lead to agency enforcement when self-initiated
Environmental Inspection	Initiated by environmental regulatory agencies	Conducted in the summative stage (ex-post)	Environmental management tool	Likely lead to agency enforcement

Table 4.3 Relationships and differences between environmental program evaluation and three different environmental management tools

Environmental program evaluation, environmental auditing and environmental inspection are all carried out mostly when a development is already in place.[265] Environmental auditing and environmental inspection, in particular, are essentially environmental management tools that can improve environmental performance and reduce cost,[266] except environmental inspections are supervisory reviews initiated by environmental regulatory agencies while environmental auditing can also by self-initiated. However, many environmental regulatory agencies have been concerned largely with the set standards, scopes and processes of environmental management—developing regulations, writing permits, conducting inspections, issuing compliance orders and fines, encouraging participation in voluntary programs, and so forth.[267] In fact, many environmental management system programs themselves have been examined at times with environmental program evaluation analysis.[268]

[265] Environmental Impact Assessment (EIA), on the contrary, is designed to project the negative impacts of proposed policies or programs on natural environment in the formative stage of a project. It is an anticipatory tool legally mandated for many projects in most countries – including China.

[266] Environmental Auditing: A Useful Tool That Can Improve Environmental Performance and Reduce Costs. (n.d.). Retrieved August 20, 2019, from https://www.gpo.gov/fdsys/pkg/GAOREPORTS-RCED-95-37/html/GAOREPORTS-RCED-95-37.htm.

[267] Bennear, L. S., & Dickinson, K. L., no. 235 above, at pp. 4.

[268] Cahill, L. B. (2002). Conducting Third-Party Evaluations of Environmental, Health, and Safety Audit Programs. Environmental Quality Management, Vol. 11, pp. 39–49. https://doi.org/10.1002/tqem.10027; Gordon, L., Bruce, N., Suh, K. N., & Roth, V. (2014). Evaluating and operationalizing an environmental auditing program: a pilot study.

With China's major environmental campaign programs having punished more than 30,000 companies and disciplined over 20,000 officials, it is clear now that China's latest anti-pollution drive has embraced full and strict governance over the Party together with mostly environmental enforcements, as well as environmental auditing, environmental inspections and other environmental management tools, but not environmental program evaluation analysis. While under some circumstances, the processes of environmental management and environmental enforcements have some relation to improve environmental performance, in other circumstances these relationships are imperfect and often poorly understood[269] so that it may make more sense to carefully evaluate the agency's activities and environmental management processes instead of turning scarce resources into "testbed daze". For example, facing environmental audits to decide local officials' promotions[270], their rush to please or simply fear of being sacked may have unexpectedly distort how environmental policy is made and implement, sometimes with unwanted consequences. Moreover, without the ability to measure program progress, government officials will likely to hesitate to dedicate large resource efforts toward developing and implementing complex environmental programs.

Part Two: Identifying China's environmental program evaluation approaches, key authorities and entities

In the field of environmental policy, the climate mitigation interventions or treatments often includes government mandated regulations, a variety of implementation strategies, and even international treaties.[271] For each intervention or treatment to be evaluated, the researcher and evaluator must obtain different sets of reliable methods and tools to analyze the efficacy of alternative structural options, market design, environmental mitigation models, and support mechanisms, and the degree of effects will vary considerably according to differing intent, priorities and methods, as well as a wide diversity of legal-administrative instruments chosen. This section will provide examples of programs describing the current use of environmental program evaluation in China, and tease out relevant environmental program evaluation authorities and entities.

This section examines five particular environmental evaluation programs and identifies China's key environmental program evaluation authorities and entities. It draws from China's environmental program evaluation approaches and patterns to date to discuss their effectiveness and flaws. It argues that most of China's environmental program evaluations are internal evaluations and results-oriented. Meanwhile, it shows that evaluations are imposed mainly on project owners and lower level government agencies as a way of top-down governance instead of actually accessing agency performance and government accountability.

American Journal of Infection Control, 42(7), 702–707.

[269] Bennear, L. S., & Dickinson, K. L., no. 235 above, at pp. 4.

[270] China Focus: Environmental audits to decide official promotions - Xinhua | English.news.cn. (n.d.). Retrieved August 20, 2019, from http://www.xinhuanet.com/english/2017-07/06/c_136422947.htm

[271] Bennear, L. S., & Coglianese, C. (2005). Measuring Progress: Program Evaluation of Environmental Policies. Environment: Science and Policy for Sustainable Development, 47(2), 22–39, at pp. 28.

IDENTIFYING CHINA'S ENVIRONMENTAL PROGRAM EVALUATION APPROACHES, PATTERNS AND EFFECTIVENESS

So how does program evaluation and how do its different types of methodological tools get established in China's environmental and energy field? This section identifies five distinct evaluation programs explaining key roles for China's varying levels of governmental agencies and correspondingly power, these explanations identifying, in turn, ways of China's environmental program evaluation. Over the past three decades, five particular evaluation programs were set which are mentioned hereunder.

1. **NEA's monitoring and evaluation of renewable energy implementation strategies**
2. **Establishment of the fair competition review system (FCRS)**
3. **NDRC's ex-post evaluation of government's investment projects; NEA's ex-post evaluation of the usage of government investment fund in the energy industry**
4. **Mid-term evaluation of China's FYPs**
5. **Evaluations of China's recent poverty alleviation programs**

1. NEA's monitoring and evaluation of renewable energy implementation strategies

A monitoring and evaluation system of a variety of implementation strategies of promoting renewable energy, including solar PV power generation market environment, provincial-level renewable portfolio standard (RPS) performance, renewable energy power development, clean energy demonstration province/region, and so on.

a. Monitoring and evaluation of solar PV power generation market environment

It is also called the "solar PV generation market investment monitoring and early warning system". On December 2017, the National Energy Administration (NEA) announced the "Circular on the establishment of a market environment monitoring and evaluation system to guide the healthy and orderly development of the solar PV industry"[272]. The results of the 2017 and 2018 (first three quarters) solar PV power generation market environment monitoring and evaluation were released in February 2018 and later in November. Under this monitoring and evaluation system, general solar PV power generations and solar PV top runner demonstration projects are monitored and evaluated by the NEA and the National Renewable Energy Information Management Center based on provincial-level administrative areas with different benchmarking feed-in-tariff (FIT) prices. Village-level solar PV power plants for poverty alleviation or distributed solar PV systems are not included in this system. The various binding evaluation indicators are group into the competitiveness evaluation index (for land conditions, local government services, grid enterprise services, the level of national electricity subsidies, the average reduction in subsidy for projects with FIT determined in competitive allocation, and the level of local government subsidies) and the risk evaluation index (for the level of solar PV

[272] Governmental resource from China NEA New Energy [2017] No. 79, retrieved from: http://www.ne21.com/news/show-100184.html.

curtailment, market consumption risk, and the level of implementation of the guaranteed full purchase policy)[273] – the former analyzes the market development environment and the latter examines the investment and operation risk of these regions. Evaluation results are divided into three levels of green, orange, and red, representing relatively good, normal, and relatively poor[274].

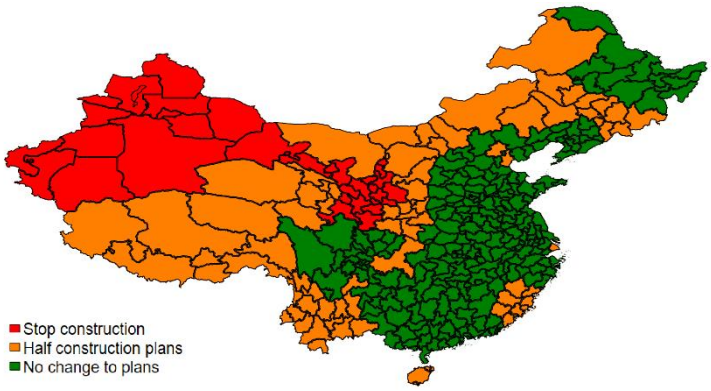


Figure 4.2 2017 solar PV market environment monitoring and evaluation results

In principle, regions and areas where a red evaluation result is issued, the NEA will not allocate an annual quota for new construction for the year, and grid enterprises will be advised to suspend accepting applications for grid connection of projects, and industry will be advised to invest with caution; For where an orange evaluation result is issued, the NEA may allocate a guiding development quota of up to 50% of existing annual plans, under the precondition that energy authorities of the provincial-level government issue effective measures to protect and improve the market environment; For where a green evaluation result is issued, the annual quota will remain the same, and further appropriate levels of support will be provided by the NEA (See Figure 4.2[275]).

b. Similarly:

The NEA has also established or plan to establish the monitoring and evaluation system (or the market investment monitoring and early warning system) of wind power generation market environment, biomass power generation market environment, the renewable energy guaranteed full purchase and industrial

[273] Establishment of market environment monitoring and evaluation system to guide the healthy and orderly development of the PV industry | China Energy Portal | 中国能源门户. (2017, December 8). Retrieved December 14, 2019, from China Energy Portal | 中国能源门户 website: https://chinaenergyportal.org/en/establishment-market-environment-monitoring-evaluation-system-guide-healthy-orderly-development-pv-industry/.

[274] For detailed evaluation standards and criteria, please see Establishment of market environment monitoring and evaluation system to guide the healthy and orderly development of the PV industry | China Energy Portal | 中国能源门户. (2017, December 8). Retrieved December 14, 2019, from China Energy Portal | 中国能源门户 website: https://chinaenergyportal.org/en/establishment-market-environment-monitoring-evaluation-system-guide-healthy-orderly-development-pv-industry/.

[275] Circular on 2017 PV market environment monitoring and evaluation results | China Energy Portal | 中国能源门户. (2018, March 2). Retrieved August 20, 2019, from China Energy Portal | 中国能源门户 website: https://chinaenergyportal.org/en/circular-on-2017-pv-market-environment-monitoring-and-evaluation-results/.

investment environment, the renewable energy project development mechanism, as well as the level of implementation of law and policy regarding renewable energy development and utilization. These are announced together with a series of supporting policies in the NEA's "Circular on reducing the burden on enterprises in the renewable energy sector"[276] published on April 2, 2018. According to this Circular, no national demonstration project or new renewable energy development and utilization project will be assigned to regions with a "Fail" grade.

c. Monitoring and evaluation of provincial-level RPS performance

The "Circular on reducing the burden on enterprises in the renewable energy sector" has also highlighted a monitoring and evaluation system of the provincial-level RPS performance. In March, September and November 2018, the NEA and the NDRC released the first, second, and third draft for comments[277] for China's new RPS, which includes a quota monitoring and evaluation system of renewable electricity and provincial-level RPS performance. The final version is expected to be announced before end of 2018 and the evaluation work will begin starting the first day of 2019 as the NEA guided. According to the newest draft, the provincial-level energy authorities shall estimate and propose recommendations for renewable electricity quotas for their provincial-level administrative area for that year, and submit these to the energy department of the State Council (SC) before the end of January of each year. The energy department of the SC shall organize third-party evaluation and determine renewable electricity quota for each provincial-level administrative area after consulting with the State Grid Corporation and the China Southern Power Gird Corporation prior to the end of March of each year. Once the quotas have been set, the energy department of the SC is responsible of carrying out monitoring and evaluation of the overall completion of renewable obligations in each provincial-level administrative area, as well as the overall quota organization, implementation and management work done by the relevant gird companies. The provincial-level energy department shall assess entities with renewable obligations[278] in their respective provincial-level administrative area.

d. Monitoring and evaluation of renewable energy power development

In February 2016, the NEA has announced the "Guiding opinions on the establishment of a target setting system for the development and utilization of renewable energy"[279]. Follow on NEA's statement, the NDRC soon publicized the

---

[276] Governmental resource from China NEA New Energy [2018] No. 34, retrieved from http://zfxxgk.nea.gov.cn/auto87/201804/t20180426_3156.htm.

[277] The first and second draft: "Renewable electricity quota and assessment methods" https://chinaenergyportal.org/renewable-electricity-quota-and-assessment-methods-draft-for-comments/ and https://chinaenergyportal.org/en/renewable-electricity-quota-and-assessment-methods-second-draft-for-comments/; The third draft: "Circular on the renewable electricity quota system" https://chinaenergyportal.org/circular-on-the-renewable-electricity-quota-system-draft-for-comments/.

[278] Entities with renewable obligations include: "provincial power grid companies owned by the State Grid Corp. of China—the largest utility company in the world—and Southern Power Grid, both which are government-owned; local power grid companies owned by provincial local governments; electricity retail companies with distribution grid operation permits; independent power retail companies; consumers participating in direct trading; and companies with captive power plants that purchase power through public power grids."

[279] Governmental resource from China NEA New Energy [2016] No. 54 Guiding opinions on the establishment of a target setting system for the development and utilization of renewable energy | China Energy Portal | 中国能源门户. (2016, February 29). Retrieved December 14, 2019, from China Energy Portal | 中国能源门户 website:

"Measures for the guaranteed full purchase of renewable electricity"[280] and the "Circular on administrative tasks for the guaranteed full purchase of electricity from wind and solar PV power generation"[281]. These documents established a monitoring and evaluation system of renewable energy target and implementation of guaranteed full purchase of electricity from wind and solar PV power generation. This has led to the establishment of a monitoring and evaluation system of renewable energy power development. The NEA will annually monitor, evaluate and assess renewable energy development planning, goals, and market consumption conditions of each province (autonomous region, municipality), as well as the implementation of guaranteed full purchase and shares of non-hydro renewables[282] in electricity sector and publicly announce evaluation and assessment results in NEA's yearly National renewable power development monitoring and evaluation reports.[283]

e. Monitoring and evaluation of national clean energy demonstration provinces/regions (trial)

NEA's 2016 and 2017 National renewable power development monitoring and evaluation reports also highlighted the monitoring and evaluation results of the implementation of national clean energy demonstration provinces/regions (Zhejiang, Sichuan, Ningxia, Gansu, Qinghai[284]). In January 2018, the NEA announced the "Notice on establishing a monitoring and evaluation system for clean energy demonstration provinces/regions (trial)"[285]. Under this system, relevant demonstration provinces/regions will be graded annually into three levels (relatively good, normal, and relatively bad) based on three quantitative evaluation indicators (clean energy utilization target progress, key task completion rate, clean energy consumption) and one qualitative evaluation indicator (self-evaluation report quality). The results they received will lead to more, same, or less scale of clean energy development and construction in the following year. Province/region receiving two relatively bad for two

https://chinaenergyportal.org/en/guiding-opinions-on-the-establishment-of-a-target-setting-system-for-the-development-and-utilization-of-renewable-energy/.

[280] Governmental resource from China NDRC Energy [2016] No. 625 Measures for the guaranteed full purchase of renewable electricity | China Energy Portal | 中国能源门户. (2016, March 23). Retrieved December 14, 2019, from China Energy Portal | 中国能源门户 website: https://chinaenergyportal.org/measures-for-the-guaranteed-full-purchase-of-renewable-electricity/.

[281] Governmental resource from China NDRC Energy [2016] No. 1150 Circular on administrative tasks for the guaranteed full purchase of electricity from wind and PV power generation | China Energy Portal | 中国能源门户. (2016, May 27). Retrieved December 14, 2019, from China Energy Portal | 中国能源门户 website: https://chinaenergyportal.org/circular-on-administrative-tasks-for-the-guaranteed-full-purchase-of-electricity-from-wind-and-pv-power-generation/.

[282] The requirements for strengthened utilization of hydropower were laid out in NEA's document. See NEA New Energy [2016] No. 54, no. 280 above.

[283] For details from the annual national renewable power development monitoring and evaluation reports and evaluation methods, see http://zfxxgk.nea.gov.cn/auto87/201608/t20160823_2289.htm (2015); http://zfxxgk.nea.gov.cn/auto87/201704/t20170418_2773.htm (2016); http://zfxxgk.nea.gov.cn/auto87/201805/t20180522_3179.htm (2017). The detailed evaluation work were done by China National Renewable Energy Center (CNREC).

[284] Qinghai is only listed as national clean energy demonstration province in the 2017 report.

[285] Governmental resource from China NEA New Energy [2018] No. 9 Notice on establishing a monitoring and evaluation system for clean energy demonstration provinces (regions) (Trial) | China Energy Portal | 中国能源门户. (2018, January 19). Retrieved December 14, 2019, from China Energy Portal | 中国能源门户 website: https://chinaenergyportal.org/notice-establishing-monitoring-evaluation-system-clean-energy-demonstration-provinces-regions-trial/.

years in a row will no longer stand as national clean energy demonstration province/region.

2. Establishment of the fair competition review system (FCRS)

On June 1, 2016, China's SC issued the "Opinions on establishing a fair competition review system in the building of the market system"[286] and had attracted widespread attention specially from researchers, experts and practitioners in the antitrust law, competition policy, international economic law, as well as environmental law and energy law field. The FCRS is in line with China's efforts to establish a more market-oriented economy regime, to safeguard a fair competition environment by reducing unwarranted state interventions, to "level the playing field for enterprises, and join the trend towards global convergence in competition policies"[287]. On December 22, 2016, the General Office of the SC announced the "Letter on approval of the establishment of the inter-ministerial joint meeting system for fair competition review"[288] which set the Joint Meeting (consists of 28 departments and entities) as the implementing body of the FCRS. However, many concerns and questions remained about how far and how quickly the Chinese government would move in implementing the FCRS.[289] On October 23, 2017, five ministries/departments of the SC jointly issued the detailed implementing rules of FCRS[290] (hereafter referred as the "Notice"). According to the "Notice", all policy-making organs[291] shall conduct strict self-review "in developing rules, regulatory documents, and other policies and measures for market access, industry development, investment promotion, bidding, government procurement, code of operations, and qualification standards, among others, involving the economic activities of market participants" and conduct a post-review assessment regularly "once every three years or at their discretion according to the actual circumstances" evaluating the impacts of policies and measures issued after a fair competition review "on the unified national market and fair competition". Review standards include 18 criteria[292] concerning a) standards for market access and exit, b) standards for the free flow of goods and factors, c) standards for the impact on the costs of production and distribution, and d) standards for acts impacting production

---

[286] Governmental resource from China SC [2016] No. 34 http://en.pkulaw.cn.libproxy.berkeley.edu/display.aspx?id=3cdb8cffb7d41463bdfb&lib=law; Original source in Chinese: http://www.gov.cn/zhengce/content/2016-06/14/content_5082066.htm.

[287] E15 Initiative | China's fair competition review system: Momentum for competitive neutrality and an open market. (n.d.). Retrieved December 14, 2019, from E15 Initiative website: http://e15initiative.org/blogs/chinas-fair-competition-review-system-momentum-for-competitive-neutrality-and-an-open-market/.

[288] Governmental resource from China SC General Office [2016] No.109, retrieved from: http://en.pkulaw.cn.libproxy.berkeley.edu/display.aspx?id=eafb1a9cd40c7708bdfb&lib=law.

[289] See Huang, B. Y., & Wu, B. (2017). China's Fair Competition Review: Introduction, Imperfections and Solutions. Competition Policy International, Antitrust Chronicle, 3. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3143289; E15 Initiative | China's fair competition review system: Momentum for competitive neutrality and an open market, no. 287 above.

[290] Governmental resource from China NDRC Price [2017] No. 1849 Notice of the National Development and Reform Commission, the Ministry of Finance, the Ministry of Commerce and Other Departments on Issuing the Detailed Rules for the Implementation of the Fair Competition Review System (for Interim Implementation) [Effective]. Retrieved from: http://en.pkulaw.cn/display.aspx?cgid=303779&lib=law Original source in Chinese: http://www.gov.cn/xinwen/201710/5234731.htm.

[291] "administrative agencies and organizations empowered by laws and regulations to administer public affairs"

[292] "18 don'ts" - for example, "prescribing any discriminatory regulatory standards and requirements for branch offices formed in the local area by non-local businesses in terms of energy conservation and environmental protection, work safety, health and hygiene, engineering quality, and market regulation, among others"

and distribution.[293] The "Notice" does not specify review authorities or responsible bodies [294] in charge of conducting the review, however, "all regions and all departments are encouraged to engage third-party professional bodies to assist in their fair competition review and regular assessment of policies and measures." In practice, such third-party review is often done through government procurement of services and needs a more professional and independent third-party evaluation system in general. Also, there are calls for incorporating the FCRS into China's Anti-Monopoly Law and exploring the mechanism of co-review by Anti-Monopoly enforcement agencies and policy-making agencies to better combine their efforts.[295] Nevertheless, the FCRS is facing with the same difficulties as other evaluation approaches when it comes to assessing government accountability, due process, government budgets, and government program efficiency, etc.

3. NDRC's ex-post evaluation of government's investment projects; NEA's ex-post evaluation of the usage of government investment fund in the energy industry

In July 2016, the Central Committee of the Communist Party of China (CPC) and the SC issued the "Opinions on deepening the reform of the investment and financing system"[296] which includes a whole section on improving the government investment system. It stated that "the government investment program approval system shall be improved and regulated, and, if a program, in which investment is directly made, or into which the capital is injected, has a significant impact on the social and economic development and the general public interests, or features relatively large-scale investment, the project proposal, feasibility study report and preliminary design shall, on the basis of the assessment of consultation institutions, public participation, expert evaluation, risk assessment, and other scientific argumentation, be strictly approved. " Also, "an ex-post evaluation system shall be established, and the government investment accountability system shall be improved."

However, the above-mentioned "ex-post evaluation system" of programs funded by the Central Government was put into trial in January 1, 2009 based on the NDRC's "Notice on issuing the administrative measures for ex-post evaluation of projects funded by the Central Government (for trial implementation)"[297] and has not yet been shaped up except detailed administrative measures and a sample evaluation report

---

[293] For a flow chart of review process, the written review conclusion form, review criteria, exceptions, public supervision and accountability rules, see http://en.pkulaw.cn.libproxy.berkeley.edu/display.aspx?id=f9b26d18bc1fd031bdfb&lib=law.

[294] "The self-review may be under the charge of a specific operating division of the policymaker or a particular body designated solely for such purpose by the policymaker, or be otherwise implemented." "In conducting a fair competition review, a policymaker may request the opinions of experts, scholars, legal advisers, and professional bodies."

[295] Zhang S., Goldstein D., Putting China's Fair Competition Review System into Action, retrieved from: http://s3.amazonaws.com/cdn.orrick.com/files/PuttingChinaFairCompetitionReviewSystemIntoAction.pdf.

[296] Governmental resource from China CPC central committee [2016] No. 18, retrieved from: http://en.pkulaw.cn.libproxy.berkeley.edu/display.aspx?id=06747f80fc67fe6ebdfb&lib=law&SearchKeyword=&SearchCKeyword=%cd%b6%c8%da%d7%ca.

[297] Governmental resource from China NDRC Investment [2008] No. 2959, retrieved from: http://en.pkulaw.cn.libproxy.berkeley.edu/display.aspx?id=d714811eb5216460bdfb&lib=law&SearchKeyword=&SearchCKeyword=%d5%fe%b8%ae%cd%b6%d7%ca.

outline with logic model and success evaluation forms released in 2014[298]. According to these two documents, the NDRC is responsible of determining programs in need of ex-post evaluations from a variety of program types based on their self-evaluation reports. A list of 9 different types of programs are the main target of the NDRC's ex-post evaluation, among which includes programs that have major impact on resource conservation, environmental protection, programs using new technology, and programs that have demonstration value. In practice, most renewable energy programs and national demonstration projects in the electricity sector are subject to the NEA's three-month ex-post evaluations one year after being put into operation.[299] Both self-evaluation and ex-post evaluation can be consigned to non-overlapping engineering consultants with corresponding qualifications. The NDRC authorizes the China National Association of Engineering Consultants (CNAEC) to conduct regular practice inspection on relevant engineering consulting institutions and their personnel's evaluation work.

Apart from the NDRC's ex-post evaluation of government's investment projects, in March 2017, the NEA announced the "Opinions on deepening the reform of investment and financing systems in the energy industry"[300] and established an ex-post evaluation system of the usage of government investment fund in the energy industry (including a blacklist system). At present, such evaluation is still imposed mainly on project owners, dedicating to strengthen the government investment accountability system and to better supervise these projects.

4. Mid-term evaluation of China's FYPs

China has started conducting mid-term evaluations of its Five-Year Plans (FYPs) since the 10th FYP period.[301] It is designed to generate periodical information for better implementing, revising the current FYP and formulating new ones. On February 2018, the NDRC announced the "Notice on conducting mid-term evaluation of the implementation of the 13th FYP"[302] including an entire section of suggested evaluation methods and measures. For the electricity sector, in 2016, the NEA issued the "Notice on issuing the measures for power planning management"[303] which established the periodical evaluation system (Article 40) and the dynamic adjustment system (Article

[298] Governmental resource from China NDRC Investment [2014] No. 2129, retrieved from: http://www.ndrc.gov.cn/gzdt/201411/t20141127_649790.html

[299] A list of these environmental and energy programs including but not limited to:
https://chinaenergyportal.org/wind-power-development-and-construction-management-interim-measures/
https://chinaenergyportal.org/interim-measures-management-development-construction-off-shore-wind-power/
https://chinaenergyportal.org/measures-management-national-demonstration-projects-electricity-sector/
https://chinaenergyportal.org/promoting-the-construction-of-biomass-briquette-city-heating-demonstration-projects/
https://chinaenergyportal.org/en/guidelines-for-promoting-new-energy-micro-grid-demonstration-projects/
https://chinaenergyportal.org/en/13th-fyp-development-utilization-plan-geothermal-energy/

[300] Governmental resource from China NEA Legal Reform [2017] No. 88, retrieved from: http://zfxxgk.nea.gov.cn/auto81/201705/t20170502_2782.htm.

[301] Macesich, G. (1964). Yugoslavia: The Theory and Practice of Development Planning. University Press of Virginia, at pp. 56.

[302] Governmental resource from China NDRC Planning [2018] No. 238, retrieved from: http://ghs.ndrc.gov.cn/zcfg/201802/t20180209_877081.html

[303] Governmental resource from China NEA Electricity [2016] No. 139, retrieved from: https://chinaenergyportal.org/power-planning-management/; Original source in Chinese: http://zfxxgk.nea.gov.cn/auto84/201606/t20160606_2258.htm.

34) of China's development plans for the electricity sector. Also, the "planning and implementation" section of the NEA's "13th FYP development plan for the electricity sector"[304] in 2016 and the NEA's "Notice on conducting mid-term evaluation and dynamic adjustment of the 13th FYP development plan for the electricity sector" in 2018 further refined the evaluation and possible amendment process of China's electric power development plans. For example, the 105-GW national target set of total solar PV power generation installation capacity for the 13th FYP (2016-2020) was met in advance because of the blowout growth in 2017. It is highly possible that the NEA will revise its renewable energy development plans in early 2019.[305]

5. Evaluations of China's recent poverty alleviation programs

On March 4, 2014, the Chinese premier, Li Keqiang, declared at the National People's Congress that China "will resolutely declare war against pollution as we declared war against poverty". As policymakers push for reforms and innovation in recent years, China has started strong and urged solid efforts to win the "three tough battles" of preventing financial risks, reducing poverty and tackling pollution in the CPC central committee's Central Economic Work Conferences.[306] China has set 2020 as the target year to finish building an all-round well-off society[307], to completely eradicate poverty. To realize the goal, pollution control, improvement in the overall environment and citizens' quality of living, adjusting and upgrading industrial and energy structures and eliminating outdated capacity, have all been front-and-center on the government's agenda and key battlefields, especially those for poverty-stricken areas. The Leading Group of Poverty Alleviation and Development (CPAD) is one of the Deliberation and Coordination Organs directly under the SC. It is the top governing body of China's various poverty alleviation and development programs, and it is also the first government agency in China that has a separate internal department of examination and evaluation.

The examination and evaluation of China's poverty alleviation programs was first brought up together with the idea of precision poverty alleviation, the term of which was put forward by President Xi in 2013, "whereby the government has compiled a national database to better analyze the number of people living in poverty[308]" so that specific households or villages in the poverty-stricken area can be targeted or helped. Under this mechanism, public satisfaction survey, performance evaluation and third-party evaluation[309] are conducted to make sure more meaningful projects can be arranged, money for poverty alleviation reallocated more effectively,

---

304 13th FYP development plan for the electricity sector, retrieved from: https://chinaenergyportal.org/en/13th-fyp-for-the-electricity-sector-full-text/; Original source in Chinese: http://www.ndrc.gov.cn/zcfb/zcfbghwb/201612/P020161222570036010274.pdf.

305 Original resources in Chinese ,see http://news.bjx.com.cn/html/20180808/919131.shtml; http://www.nbd.com.cn/articles/2018-11-05/1269373.html; https://www.powermag.com/china-sets-a-new-renewable-portfolio-standard/.

306 Xi stresses efforts to win "three tough battles" - Xinhua | English.news.cn. (n.d.). Retrieved August 21, 2019, from http://www.xinhuanet.com/english/2018-04/02/c_137083515.htm.

307 Or called "a moderately prosperous society in all respects"

308 Chinese Terminology: Precise Poverty Alleviation. (n.d.). Retrieved August 21, 2019, from https://news.cgtn.com/news/3d63444f77514464776c6d636a4e6e62684a4856/share_p.html.

309 Original resource in Chinese: *授权发布：中共中央 国务院关于打赢脱贫攻坚战的决定-新华网*. (n.d.). Retrieved December 14, 2019, from http://www.xinhuanet.com/politics/2015-12/07/c_1117383987.htm.

accomplishments clearly seen, and all social sectors (private enterprises, social organizations, individuals, NGOs[310]) better motivated. In early 2017, the People's Bank of China, the China Banking Regulatory Commission, the China Securities Regulatory Commission and the General Office of CPAD together announced the "Notice on evaluating the effects of the policy for precision poverty alleviation by finance"[311], which further explained the significance of the evaluation work and called for developing with delay the detailed rules for the implementation of the evaluation work, a better coordination and information and data sharing system, as well as a mechanism for the application and disclosure of evaluation results. Moreover, in May 2018, the General Office of the SC forwarded the "Notice on issuing the measures for poverty alleviation program budget performance evaluation management"[312] by the Ministry of Finance, the General Office of CPAD, and the NDRC.

In the environmental and energy field, detailed poverty alleviation programs, according to government sources[313], including but not limited to grain for green, natural forest protection, shelterbelt construction, rocky desertification control, prevent and control of desertification, wetland conservation and restoration, slop cropland comprehensive remediation, return grazing land to grassland, waste water ecological control, reinforcement of dilapidated reservoirs, water conservancy construction, drinking water safety consolidation and improvement, anti-drought and river control, soil erosion comprehensive treatment, rural land comprehensive regulation and well-facilitated farmland development, prevention and control of geological and meteorological disaster, hydropower development and benefit sharing, solar PV poverty alleviation, rural power grid upgrade and full power coverage, horizonal ecological protection compensation, and forestry carbon sink programs.

Among these, the solar PV poverty alleviation program has attracted the most attention since its launch early in 2014[314] as a program that combines industrial, development and social policy goals within one instrument, with rooftop solar PV systems for poor households currently registered, and solar PV power stations near poverty-stricken counties or villages utilizing non-arable land and rooves of greenhouses, as its two installation options. However, in 2017 and early 2018, China's

---

310 Governmental resource from China SC General Office [2014] No. 58, retrieved from: http://www.pkulaw.cn.libproxy.berkeley.edu/fulltext_form.aspx?Db=chl&Gid=1cd6150e6d50c32ebdfb&keyword=%E6%89%B6%E8%B4%AB&EncodingName=&Search_Mode=accurate&Search_IsTitle=0

311 Notice of the People's Bank of China, the China Banking Regulatory Commission, the China Securities Regulatory Commission and the State Council Leading Group Office of Poverty Alleviation and Development on Evaluating the Effects of the Policy for Precision Poverty Alleviation by Finance, retrieved from: http://en.pkulaw.cn/display.aspx?id=7fa71246d5fdd699bdfb&lib=law&SearchKeyword=&SearchCKeyword=%b7%f6%c6%b6.

312 Governmental resource from China SC General Office [2018] No. 35, retrieved from http://www.pkulaw.cn.libproxy.berkeley.edu/fulltext_form.aspx?Db=chl&Gid=a09a13fe2c1f4f5ebdfb&keyword=%E6%89%B6%E8%B4%AB&EncodingName=&Search_Mode=accurate&Search_IsTitle=0

313 See *授权发布：中共中央 国务院关于打赢脱贫攻坚战的决定-新华网*. (n.d.). Retrieved December 14, 2019, from http://www.xinhuanet.com/politics/2015-12/07/c_1117383987.htm;
韩昊辰. (n.d.). *中共中央 国务院关于打赢脱贫攻坚战三年行动的指导意见_中央有关文件_中国政府网*. Retrieved December 14, 2019, from http://www.gov.cn/zhengce/2018-08/19/content_5314959.htm.

314 Governmental resource from China NEA New Energy [2014] No. 447 Implementing the PV poverty alleviation project working plan | China Energy Portal | 中国能源门户. (2014, October 11). Retrieved December 14, 2019, from China Energy Portal | 中国能源门户 website: https://chinaenergyportal.org/implementing-the-pv-poverty-allevation-project-working-plan/.

solar PV industry has experienced a massive installation surge responding to the generous government subsidies, followed instantly with the pivotal "531" policy by the NDRC, the Ministry of Finance, and the NEA at the end of May 2018, which sought to control the blowout growth of major solar PV projects by phasing out subsidies. This so-called "China's solarcoaster"[315] experience has caused great uncertainties and panic for the overall solar PV industry.

The country's leadership has made it clear that China's poverty alleviation is "a battle that must be won". With a clear poverty-free vision and a closing deadline, China's government has noted the importance of policy persistence, stability, as well as effectiveness-oriented policy evaluations. For example, according to the NDRC's "opinions on tasks for implementing the use of solar PV for poverty alleviation",[316] the government shall "establish a project operation management system that is long-term reliable". Also, Article 10, Article 15, and Article 17 of the "administrative measures for solar PV power stations for poverty alleviation"[317] have stipulated a unified coding and information entry index system, and an acceptance and evaluation system which apply to all solar PV poverty alleviation projects. However, it remains an open question how these systems are going to evolve and to help supervising the construction and maintenance of solar PV poverty alleviation project activities once the 2020 deadline is passed.

IDENTIFYING CHINA'S ENVIRONMENTAL PROGRAM DEPARTMENTS WITHIN GOVERNMENTS AND THIRD-PARTY EVALUATION BODIES

Agency is becoming important as all-embracing structural attempts to explain political interactions look increasingly tired,[318] even while they are influenced by broad social, political, economic, international and institutional factors, and even by agency officials' own accumulated experiences, as real choices are made by these agencies while analyzing success of attempted policy reforms in often similar circumstances. These make a difference in terms of what knowledge and policy becomes influential and which key administrators make a difference. Also, more and more private firms and organizations begin to participate or even be deeply involved in undertaking a fraction of environmental program evaluation work through certain contractual relationships – not only between firms, but also between a government and a firm, such as some regulatory relationships and public-private partnerships. This section will cover key authorities and entities with responsibility or be authorized to conduct most of the environmental program evaluation work in China.

1. National and local People's Congress, and other planning departments at

[315] Molly. (2018, October 31). China's solarcoaster: from tariffs to trade war. Retrieved August 21, 2019, from Power Technology | Energy News and Market Analysis website: https://www.power-technology.com/features/chinas-solarcoaster-tariffs-trade-war/.

[316] Governmental resource from China NDRC Energy [2016] No.621 Opinions on tasks for implementing the use of PV for poverty alleviation | China Energy Portal | 中国能源门户. (2016, March 23). Retrieved December 14, 2019, from China Energy Portal | 中国能源门户 website: https://chinaenergyportal.org/en/opinions-on-tasks-for-implementing-the-use-of-pv-for-poverty-alleviation/.

[317] Announced by the NEA and the SC Leading Group Office of Poverty Alleviation and Development, available at: https://chinaenergyportal.org/en/administrative-measures-for-pv-power-stations-for-poverty-alleviation/.

[318] Keeley, J., & Scoones, I., no. 237 above, at pp. 29.

all levels

As China's top legislative bodies, the National People's Congress (NPC) and its Standing Committee are responsible of examining and approving the report on the plan for national economic and social development and on its implementation, report and central budget, and more, including pre-deliberating and deliberating China's FYPs drafted by the SC and the NDRC. In addition to the Standing Committee, nine Special Committees under the NPC are established to study and evaluate issues related to specific fields, including the Financial and Economic Affairs Committee, and the Environmental Protection and Resources Conservation Committee. The National and local People's Congress are also responsible for post-legislation evaluations and periodic reexamination of existing laws and regulations.

Thus, the existence of such comprehensive cross-sectoral development plans gives a strong indication of a political commitment to the crucial role of planning and how a government relates to program evaluation in the overall decision-making and plan-formulation context. However, in practice, the implementation of detailed evaluation work of China's sectoral government programs and plans are done by the SC, the NDRC, local governments and other planning departments at all levels. According to "Several Opinions of the State Council on strengthening the formulation of planning for national economic and social development"[319], plan-formulation departments are responsible of conducting evaluations "timely when appropriate" while implementing programs and plans of their own. The evaluation work can also be authorized to other institutions. Evaluation results need to be written into reports as important evidence for future amendments of such programs or plans.

2. Internal departments (offices) of general affairs and departments (offices) of planning of the NDRC, the NEA, the MEE, and their local and regional branches.

Further, the NDRC is bound to evaluate matters related to economic and social development, as these are considered as integral aspects of cross-sectoral development plans and an overarching responsibility for climate issues. The NEA and the MEE, at the same time, have been assigned to handle energy issues and major ecological and environmental issues. Some of the evaluation work for smaller projects will be referred by the NDRC, the NEA and MEE to their local and regional branches together with other administrative responsibilities. This creates **a vertical climate governance system** that transfers decision-making power top-down - from elite decision-making bodies to different levels of relevant local and regional authorities. For example, from the NDRC to its local counterparts (provincial Development and Reform Commissions), from the MIIT to the provincial offices of the Economic and Information Commission, and so forth (see Table 4.4). Sub-national agencies and governments are expected to implement policies determined centrally[320] and

[319] Governmental resource in Chinese: *国务院关于加强国民经济和社会发展规划编制工作的若干意见*, retrieved from: http://www.pkulaw.cn/fulltext_form.aspx?Db=chl&Gid=29b1978f687f1cf1bdfb&keyword=%E7%A4%BE%E4%BC%9A%E5%8F%91%E5%B1%95%E8%A7%84%E5%88%92%E7%BC%96%E5%88%B6&EncodingName=&Search_Mode=accurate&Search_IsTitle=0.

[320] Schreurs, M. (2017). Multi-level climate governance in China. Environmental Policy and Governance, 27(2),

"administratively subcontracted[321]" to local governments. The central government sets targets for provincial governments, which in turn set targets for lower level local governments[322]. However, some sub-national agencies are under direct supervision of local governments, while other sub-national agencies are directly oversight by its higher-level competent authorities under the central government.

National	Sub-national
State Administration of Taxation	Provincial offices of the State Administration of Taxation
Ministry of Finance	Local Bureau of Finance
Ministry of Housing and Urban Rural Development	Local Commission of Housing and Urban Rural Development
Department of Price of the NDRC	Local Price Bureau
The Ministry of Industry and Information Technology	Provincial offices of the Economic and Information Commission
The National Development and Reform Commission	Provincial Development and Reform Commissions
National Energy Administration	Regional Energy Regulatory Bureaus Provincial Energy Regulatory Office
Former Ministry of Environmental Protection (merged into the Ministry of Ecology and Environment in 2018)	Regional (Environmental Protection) Inspection Bureaus Regional Office of Nuclear and Radiation Safety Inspection Local Environmental Protection Bureaus
State Administration of Taxation	Provincial Offices of the State Administration of Taxation

Table 4.4

Here, it is worth identifying the two particular departments/offices implementing most of the internal environmental program evaluations in a given sector – the internal department/office of general affairs and the internal department/office of planning. These are two of the most common internal departments of the cabinet-level ministries constituting the SC. In general, the internal department/office of general affairs of all levels has been entrusted with the responsibilities of record-keeping, inspections, policy/information disclosure, confidential information communication and management, data-collecting, information acquisition, forecasting and early-warning, comprehensive coordination, environmental policy integration, and internal auditing. Moreover, it often plays a critical role in agencies' participatory policy processes, including government information disclosure, coordinating and organizing

163–174.

321 Zhou, L. Administrative subcontract. Chin. J. Social. 2014, 1-38. (In Chinese)

322 Young, O. R., Guttman, D., Qi, Y., Bachus, K., Belis, D., Cheng, H., … Zhu, X. (2015). Institutionalized governance processes: Comparing environmental problem solving in China and the United States. Global Environmental Change: Human and Policy Dimensions, 31, 163–173.

expert consultation meetings, arranging talks between government agencies and representatives of industry associations discussing issues related to specific fields, holding public hearings, sending out circulars - drafts for comments and "requests for comments"[323], and collecting feedbacks. The internal department/office of planning (also referred to as the internal department/office of plans and programs), on the other hand, is often responsible of conducting research, giving policy strategic recommendations, formulating development plans, annual plans, industrial policies, and conducting periodic ex-post evaluations and reexaminations. It also takes the charge of sectoral financial budget plans. According to government sources[324], the NEA's ex-post evaluation system of the usage of government investment fund in the energy industry is led by its department of planning.

Apart from these two internal departments/offices, the newly established MEE and the CPAD have shown us two possible alternatives – the former has an internal department of general affairs[325] which merged all the functions of the internal department of planning of the original MEP (former MEE), and the latter has the first internal department of examination and evaluation among China's government agencies. According to news of the latest round of government institutional reform, the NDRC is forming up a brand-new internal department of supervision and evaluation – office of key project inspectors, involving a multidisciplinary team.

3. Environmental and energy authorities and entities of the provincial-level government

Equally important is **the horizonal climate governance system** which involves all sorts of ministerial sectoral targets, benchmarks, and measures for objective assessment of implementation results. Under China's current multi-tiered climate governance structure, environmental and energy authorities and entities at the provincial level of China's government are regulated by a hybrid governance system. Some of them report to their cabinet-level ministerial departments, some of them are regulated by the provincial-level government, and some of them are under big state-owned enterprises (SOEs). Thus, when it comes down to evaluating local and regional environmental and energy projects within provincial-level administrative area, provincial-level government is accountable for coordinating relevant environmental and energy authorities and entities, and reporting evaluation results to the cabinet-level ministerial departments.

4. Third-party evaluation bodies and others

Apart from the above-mentioned environmental program evaluation departments within government, more and more external evaluation bodies and other entities have been involved in implementing specific third-party evaluation projects through directional authorization or public bidding, including well-known research institutes,

---

[323] *征求意见的函*, it is widely used by China's government agencies in the policy-making process, with specific target authorities and entities listed in the circulars.

[324] See *政府信息公开目录---国家能源局--国家能源局关于深化能源行业投融资体制改革的实施意见*. (n.d.). Retrieved December 14, 2019, from http://zfxxgk.nea.gov.cn/auto81/201705/t20170502_2782.htm, appendix.
http://zfxxgk.nea.gov.cn/auto81/201705/t20170502_2782.htm

[325] See Department of General Affairs. (2018, November 30). Retrieved December 14, 2019, from http://english.mee.gov.cn/About_MEE/Internal_Departments/201811/t20181130_676847.shtml.

evaluation advisory bodies, and think tanks both home and abroad.

a. Participating institutions through directional authorization

Most of these institutions are non-governmental but not completely independent. For example, the NDRC has authorized the China National Association of Engineering Consultants (CNAEC), as the only national representative of China's consulting engineering industry, to conduct regular practice inspection on all engineering consulting institutions with corresponding qualifications and their personnel's evaluation work. However, many of its appointed directors and high-rank council members are former officials or directors of the State Development Planning Commission (SDPC, transformed into the NDRC in 2003), the NDRC, and big SOEs. Nevertheless, the Chinese Academy of Sciences (CAS), as an institution directly under the SC, is authorized with many of China's third-party evaluation work, including the third-party performance evaluation program of national precision poverty alleviation[326] led by the CAS Institute of Geographic Sciences and Natural Resources Research (IGSNRR). Finally, many participating institutions are under subsidiary corporations of big SOEs. For instance, the NEA and the CPAD have authorized the National Solar PV Poverty Alleviation Information Monitoring Center (under State Grid Corporation of China, one of China's two grid monopolies – State Grid and Southern Grid) to create unified coding and directory for all solar PV poverty alleviation projects; and have the National Renewable Energy Information Management Center (under the China Renewable Energy Engineering Institute, regulated by the Power Construction Corporation of China) to collect and entry all relevant information.

b. Participating institutions through public bidding

According to the NEA's Announcement of successful bid in public bidding of 2018 energy planning evaluation and research projects[327], a list of winning entities includes the China Electric Power Planning and Engineering Institute, the China Renewable Energy Engineering Institute, the NDRC Energy Research Institute, the State Grid Energy Research Institute, the China Petroleum Planning and Engineering Institute of PetroChina Company Limited (the largest oil/gas producer and distributor in China), the Provincial Energy Planning and Research Center of Hebei, the Electric Power Construction Techno-economic Consultation Center of China Electricity Council[328], Tsinghua University, and China University of Mining and Technology.

Part Three: Recent policy trends, limitations, and opportunities for learning

Against the normative and descriptive backdrops of Part 1 and Part 2, this section presents and explains patterns of China's recent policy trends that might make room for change and the prospects of better utilizing them to build social and organizational

---

[326] See Third-party Evaluation of the "Effectiveness of National Targeted Poverty Alleviation" Launched---- Institute of Geographic Sciences and Natural Resources Research，（cas）. (n.d.). Retrieved August 21, 2019, from http://english.igsnrr.cas.cn/ue/ne/201606/t20160606_164129.html; additional resource in Chinese: http://news.sciencenet.cn/htmlnews/2017/1/365212.shtm; http://www.qiantangylegw.com/news/733.html.

[327] *国家能源局 2018 年能源规划评估和研究课题公开招标中标公告 - 国家太阳能光热产业技术创新战略联盟*. (n.d.). Retrieved December 14, 2019, from http://www.cnste.org/html/jiaodian/2018/0702/3366.html.

[328] In March 2019, the China Electricity Council published a research report on the mid-term evaluation of China's 13th FYP development plan for the electricity sector, see https://chinaenergyportal.org/en/china-electricity-council-suggest-2030-target-of-1300-gw-of-coal-fired-power/.

cultures as well as agency capacity that support and maintain the ideals of program evaluation system as a positive matter.

It aims to provide suggestions for ways to better utilize China's recent policy trends to build social and organizational cultures as well as agency capacity that support and maintain the ideals of program evaluation system. First, A fundamental shift from focusing on up-front examinations and approvals to registration, archival filing, regional joint evaluation, and notification-commitment; Second, succession of strong policy support making clear that environmental enforcement is here to stay as a government priority; And finally, heavier roles of program evaluation on a par with governmental supervision in the field of climate governance.

A FUNDAMENTAL SHIFT FROM FOCUSING ON UP-FRONT EXAMINATIONS AND APPROVALS TO REGISTRATION, ARCHIVAL FILING, REGIONAL FILING, REGIONAL JOINT EVALUATION, AND NOTIFICATION-COMMITMENT

Previously, China's environmental and energy authorities paid most attentions on EIAs and construction approvals. In 2018, China central and local government authorities began to implement the reforms to "delegate power, streamline administration and optimize government services" [329] and have made great achievements in cancelling a major percentage of up-front examination and approval items of China's environmental and energy projects. In March 2019, the General Office of SC announced the "Notice of issuing the implementation opinions on comprehensively conducting the reform of the approval system for construction projects" [330] which calls for promoting regional joint evaluation and notification-commitment[331] to reduce administrative examination and approval items. The EIA approval process has also been simplified in order to reduce the burden on enterprises. "The emphasis is now on corporate operational compliance and responsible oversight.[332]" Local governments and companies have started performing internal environmental audits and having third-party evaluators accessing their environmental and energy projects including proactively screening and engaging their contractors and suppliers over compliance, to gain a greater level of comfort and better adjust to the

[329] *放管服改革*, see Part 3 of the NEA's Circular on reducing the burden on enterprises in the renewable energy sector | China Energy Portal | 中国能源门户. (2018, April 2). Retrieved December 14, 2019, from China Energy Portal | 中国能源门户 website: https://chinaenergyportal.org/en/circular-on-reducing-the-burden-on-enterprises-in-the-renewable-energy-sector/.

[330] *国务院办公厅关于全面开展工程建设项目审批制度改革的实施意见*. (2019, August 21). Retrieved August 21, 2019, from http://www.pkulaw.cn/fulltext_form.aspx?Db=chl&Gid=fc234cd5b15b054abdfb&keyword=%e5%85%b3%e4%ba%8e%e5%85%a8%e9%9d%a2%e5%bc%80%e5%b1%95%e5%b7%a5%e7%a8%8b%e5%bb%ba%e8%ae%be%e9%a1%b9%e7%9b%ae%e5%ae%a1%e6%89%b9%e5%88%b6%e5%ba%a6%e6%94%b9%e9%9d%a9%e7%9a%84%e5%ae%9e&EncodingName=&Search_Mode=accurate&Search_IsTitle=0.

[331] "Notification-commitment" under these Procedures refers to the method whereby an administrative examination and approval department makes an administration and approval decision after 1) a citizen, legal entity, or organization applies for administrative examination and approval; 2) the administrative examination and approval department in one notice informs the applicant of the requirements of examination and approval and the materials that must be submitted therefor; 3) the applicant provides written commitment to the effect that it meets all the requirements of examination and approval, and is able to submit the materials within the prescribed time limit in compliance with its promise.

[332] Corne, P., & Johnny Browaeys, no. 238 above.

new environment. This provides a historic opportunity for the growth of trained staff in the environmental and energy authorities and specialist environmental evaluators in the third-party advisory and evaluation bodies.

However, it is important to make sure that the environmental evaluation process itself will not become a perfunctorily-managed formalism that does little but to add burden for both government agencies and companies, which is exactly on the contrary to the spirit of China's current institutional reform. The focus, guidelines, measurement standards, and methods of these environmental evaluation projects need to be well designed and tailored in order to produce evaluation results and feedbacks that can be best utilized.

SUCCESSION OF STRONG POLICY SUPPORT MAKING CLEAR THAT ENVIRONMENTAL ENFORCEMENT IS HERE TO STAY AS A GOVERNMENT PRIORITY

Apart from China's government institutional reform, the current administration has shown its firm resolution in the pursuit of long-term structural changes as the "new normal" instead of short-term campaigns to guard against climate change and the deep-seated public unease about the quality of air and water. Since the 12th FYP, China's environmental policy and energy regulation has moved from a peripheral subject to a position of central theme and enduring concern both within the whole country and globally. The environmental authorities are also assuring their determination and rigor in robust environmental enforcement policies by announcing a series of measures undertaking soil and groundwater contamination, which used to be placed in the "too hard" category. Follow up with the amended Environmental Law[333] which promised to change an approach to the economy that has long favored growth at any cost, President Xi restated the conception of "ecology first" in the 2019 Second Session of the 13th NPC[334] which calls for marching toward a new high-quality development vision that sticks to green growth. Other contributing factors are coming together too, such as the surge of Chinese and foreign trans-trade investors embracing new waves of opportunities in the electricity market and the green industry market for environment-related products and services. This will lead to the growth of interest groups and active competition of advocacy coalitions for China's green industrial policy which in turn promotes the use of renewable energy and environmental technologies.

Yet, the industrial upgrading and structural transformation needed for the so-called "green growth" will not be achieved easily, especially without a benign and efficient green industry. Currently, China's green industry is still quite a mixed bag of investors and companies with a wide scale of sizes, strengths, technological levels, experiences, and intentions. The Prime Minister of the SC signaled in his speech to the executive meeting of the SC in February 2019 that policymakers must take relevant companies and industry associations' advices when formulating regulations, rules and normative documents that are closely relevant to enterprises' productions and

[333] came into effect at the start of 2015.

[334] Government resource in Chinese: *朱英. (n.d.). 以生态优先、绿色发展为导向 _ 滚动新闻 _中国政府网.* Retrieved December 14, 2019, from http://www.gov.cn/xinwen/2019-03/06/content_5371121.htm.

operations[335]. In reality, big SOEs have glutted and jumbled up the industry together with their subsidiaries and pricing power, leaving middle and small-sized companies with nothing but market chaos and little chance to be involved in the policy-making process. At all times, inconsistent policy intervention from a higher level that alters existing agency motivations is urging on companies to "make fast money and quit". A good example of this and how far a signal or single piece of instruction/comment by China's top political elites can reach is the case of distributed solar PV generations. After years of trials in concentrating solar power generations, the 13th FYP declaring the dominant position of distributed solar PV generations changed the entire solar PV industry and eliminated all the ongoing debates of the time almost overnight. According to the newest government documents, hydrogen energy is becoming the country's top priority in the renewable energy market. Experts widely projected that the policy would halt work on major solar PV projects. To cite one example, Shenzhen Seg Corporation has put a stop to its solar PV plans of emergency after three years of preparation and investment since then[336].

HEAVIER ROLES OF PROGRAM EVALUATION ON A PAR WITH GOVERNMENTAL SUPERVISION IN THE FIELD OF CLIMATE GOVERNANCE

Such haste to closely keep up with government policies at no cost may also reveal companies' greater interest in taking up as much market as possible before development quotas run out. China's environmental and energy authorities of both national and provincial levels begin to use the results of regional joint evaluations and program evaluations to make judgements and categorize regions and programs as "relatively good", "normal", and "relatively poor" or "pass" and "fail", and then allocate development quota for new constructions, new national demonstration projects or clean energy provinces/regions of the following year. Companies and local governments start to realize the importance of program evaluation, but merely as an exam instead of a collection of critical information that may actually help with program improvements. A good sign of possible normalization and scaling of China's evaluation programs is the establishment of the NDRC's internal department of supervision and evaluation and the CPAD's internal department of examination and evaluation. It is possible that in the future, the traditional results-oriented evaluation and performance measurement will be refined and widely implemented on China's various environmental and energy programs, on a par with strong governmental supervision in the field of climate governance.

If evaluation result is so important for getting development quota and government support, one might think that project owners and managers would be studying this issue actively. To some extent, this is true, but the field is very narrowly focused: evaluations are mostly imposed on lower-level governments and companies as a supervision or management tool; many enterprises focus on only their very own

[335] Governmental resource in Chinese: *雷丽娜. (n.d.). 李克强：制定涉企法规政策必须听取企业和行业协会意见_国务院常务会议视窗_中国政府网.* Retrieved December 14, 2019, from http://www.gov.cn/guowuyuan/2019-02/22/content_5367805.htm.

[336] Original resource in Chinese: *深赛格叫停光伏项目，行业还没缓过来……_龙焱.* (2019, March 19). Retrieved December 14, 2019, from http://www.sohu.com/a/302309488_468637.

sectors (e.g., solar PV, hydrogen, new-energy vehicles, etc.); each sector is left free to develop its own understanding of the concept and its implications of a "relatively good" evaluation result. Without the advent of a more systematic approach to program evaluation and governmental supervision, different departments and industries operate mostly in isolation when facing environmental inspections and environmental enforcement. The traditional results-oriented evaluations and simple answers are not particularly appropriate in the development of environmental policy. Testing assumptions and theories developed from a "bottom-up" learning exercise may well be better integrated into agency decision-making than the current "top-down" evaluation mandates. [337] Improving the effectiveness, diversification and independence of China's environmental program evaluation authorities and entities itself might nonetheless allow substantial improvements in the quality of environmental protection and energy conservation.

[337] Chien, C. V. (2018). Rigorous Policy Pilots: Experimentation in the Administration of the Law. *Iowa Law Review*. Retrieved from https://heinonline.org/hol-cgi-bin/get_pdf.cgi?handle=hein.journals/ilr104&section=63

Chapter 5 Toward a more vigorous and richly diverse environmental program evaluation system

Finally, this chapter concludes and proposes that a more vigorous and richly diverse environmental program evaluation system could discover and improve the effectiveness of China's various environmental policy and programs. The results of my analysis suggest that while not necessarily easy, a well-designed and implemented environmental program evaluation system is both feasible and worthwhile in a variety of contexts.

This final chapter sketches a number of important points and proposals one might consider that will shape environmental program evaluations' future prospects in China. First, the need of multiple forms of environmental program evaluations; Second, problems of utilization of environmental program evaluation in China's bureaucratic, legislative, and institutional settings; And lastly, create a policy and program evaluation office under the State Council or under the standing committee of the National People's Congress (NPCSC) and introduce more third-party evaluation forces when appropriate.

Part One: The need of multiple forms of environmental program evaluations

Following China's newly revised constitution and President Xi's involvement and support, new regulatory policies have required central and local governments to develop environmental legislation and accompanying programs to implement China's policy shift to climate change. However, due in part to the complexity and fragmentation of China's climate governance and energy regulatory system, most actions require different administrative branches, departments, and offices - both in central and local level – to manage different aspects of environmental and energy issues in different ways, which complicates the task of unifying rulemaking. Also, different local governments vary significantly in resources and willingness to comply with the intent of the central government. Present statutory mandates are extremely unpredictable and often result in spending large sum of resources without comparable gains in ecological and public health. Most of the times a unified rule or standard is not the answer, possibly because perceptions and attitudes differ considerably from one government agency to the next, as well as across levels of government. Therefore, environmental program evaluation in China should focus more on process, instead of actual changes in environmental quality. It is easier to ascertain whether a particular pilot project and the related administrative proceeding is substantially in accordance with state regulations than to determine whether it is actually improving environmental quality.

On one hand, inconsistencies between provinces in the collection and handling of data due to different monitoring approaches, different pollution problems, varying standards and information technology levels is complicated by an overall lack of generally accepted credible assessment methodologies, or key indicators. Once these key indicators are identified, the important tasks of data generation, data collection, data processing, and data quality assurance should be addressed. The central government needs to ensure that key government institutions have the technical and

financial resources to keep pace with the rising demand for information and data analysis. Also, data collected should be translated into policy relevant information for both citizens and program managers.

More importantly, we shall not take data as the most important information or so-called evaluation input. Because data is only fateful for the traditional results-oriented evaluations at the very end of a policy or program cycle. Technically, the process by which the most efficient program is determined can be somewhat formidable, especially when facing with data limitations. Estimating the costs and benefits of administering and complying with environmental programs pose no unusual difficulties – air, water, species, landscape, ecological systems and other intangible benefits are not traded in markets and often do not have a clear monetary value; compliance costs are often estimated using information from complying industries or affected firms which might not be prompt and accurate.

On the other hand, as argued in Part three above, in this policy shifting time while most of China's climate mitigation interventions are new, results-oriented evaluation programs with simple answers are dangerous. Formative evaluation, process evaluation and institutional evaluation may be more applicable and promising with regard to policy reconsideration and redirection, program replication, and proactive policy-making. China's policymakers should move beyond reactive policy making (only making decisions that are necessary on urgent issues), identify and absorb lessons from decades of environmental program experimentations, and begin to establish new programs that address the environmental issues of the future in the new era of China's climate governance.

Thus, for instance, suppose a city wants to address an environmental problem such as water pollution from a certain kind of factory. The first step would be a formative evaluation, which would analyze the necessity and feasibility of the proposed intervention program and acquire information that assists with early program improvement and planning. The city might want to do a pilot program to help design its approach. At this stage, the appropriate forms of evaluation would be formative evaluation and process evaluation – expert consultation, treatment fidelity studies, quality control studies and so on. If demonstration projects are to be set up, process evaluation and its description function could play a big role in analyzing activities of involved individuals and organizations to identify why a certain pilot succeeded or failed and why benefits did or did not exceed costs, and to inform the city about what it might expect if it were to replicate a similar program or to transfer the knowledge and technology from the program, and to use that information to guide its full-scale program thereafter. In the early stages of the full-scale program, apart from the continuing formative evaluation and process evaluation, the city could do an efficiency evaluation to inform it of costs and effectiveness of the existing program, its competing interventions, and its reasonable alternatives – including the alternative of no program at all. Finally, once the program is fully established, the city could do periodical impact evaluation, process evaluation and efficiency evaluation to monitor and determine how well it is working and how it might be improved.

Part Two: Problems of utilization of environmental program evaluation in China's bureaucratic, legislative, and institutional settings

Ultimate policy-making authority rests with political officials who set the policy agenda. Inevitably, organizational politics will partly determine the extent to which evaluation results are utilized. It is important to recognize the importance of political constraints in program evaluation and ensures that evaluations are not wasted because of their incompatibility with political concerns. Evaluators must ensure that evaluations are applicable to all levels of management. Flexibility with and adaption to politically influential officials are other keys to acceptance of evaluation recommendations. At another level, however, program evaluation needs to challenge the way powerful interest group politics are thinking about environmental policy and consider a public interest that is not simply the aggregation of private interests.

Also, environmental program evaluation should not only focus on improving the management of environmental programs administratively, but also play an important role in the formulation of China's environmental policies. Instead of getting involved at the end of particular rule-makings, the National People's Congress and the State Council should become more involved in the shaping of regulatory policy, in setting priorities, and in making choices about what regulations are most important. More program evaluation should be provided to assist the central government in making the difficult decisions about setting these priorities and about which programs should be expanded. The NPC and the State Council could require the key government institutions to engage in a through, systematic, and comprehensive evaluation of the programs it administers, earmarking program evaluation funds, providing criteria by which to measure program effectiveness, and setting deadlines for submitting and sharing the evaluation reports and results to committees and the public.

Lastly, timing is important. Program evaluation can contribute to demands for change, identifying problems, offering solutions, and building an analytic record. But evaluations themselves fell short of providing sufficient basis for launching policies and programs in a new direction, or a major overhaul of the law, until the central government are ready to change, or until they are overwhelmed by strong political forces that demand change. Thus, it is important that program evaluation itself needs to be able to ask whether existing regulatory programs are addressing the right problems or are treating root causes rather than symptoms of ecological damage and environmental threats to public health. It must provide a means of escaping the preoccupation with short-run results and encourage long-run thinking, so that when time comes, the government can be able to assess its environmental policy efforts, learn from experience, and make policies more efficient and effective.

Part Three: Create a policy and program evaluation office under the State Council or under the standing committee of the National People's Congress (NPCSC) and introduce more third-party evaluation forces when appropriate

Under the proposed environmental program evaluation system, all the government agencies, departments, offices, and SOEs should be legally required to cooperate with this policy and program evaluation office. The requirements for reports

to this office on the environmental quality of the nation can provide motivations for government agencies to collect information that can be used for policy-making purposes. Private organizations, though may not be required to, should be encouraged to cooperate with this office. Therefore, this office will be able to triangulate its evaluation results with policy-making organs, SOEs and private organizations, and can provide fair and balanced evaluations. Under this structure, program evaluation should be a prerequisite for effective action in the reauthorization of legislation, the appropriation of funds required to achieve statutory goals, and the formulation of new laws.

Methodically, greater reliance should be placed on relatively simple evaluation designs that can be carried out in a reasonable amount of time, and evaluators should use multiple methods and approaches so that the strength of one mitigates the weakness of another. Program accomplishment can be measured in process terms: number of enforcement actions taken, permit applications processed, permits issued, reviews completed, contracts issued during the year under review, and figures compared to those of previous years. Working groups or teams consist of evaluators and investigators need to be identified early in the process to define the environmental program evaluation scope, objectives, and expectations. These teams should be able to independently evaluate environmental programs from multiple perspectives and with multiple approaches. A Green Project Comprehensive Evaluation framework should be carefully formulated with a set of low-carbon development evaluation index, various environmental indicators and performance indicators, and other important evaluation indicators through detailed empirical research.

Also, close examination of China's agency practice and experience might call into question not only the role that environmental program evaluation should play to fill informational gaps in policy- and law- making, but also the role that the distinction between internal and third-party evaluations plays in China's environmental policy pilots.

To conclude, the prospects for environmental program evaluation to evolve from bean counting into a vigorous and richly diverse field are extremely bright. Environmental program evaluation should be matured as a field and as a profession in China.