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DOES THE LEGISLATIVE MECHANISM IS EFFECTIVE IN CONTROLLING AIR POLLUTION FROM CHINA: A THOROUGH STUDY

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ABSTRACT: *Air pollution problems in China are related to imperfect legislation and potential integration problems among legislation, plans, and policy-making. The purpose of this study is to make the overall system for prevention and control of air pollution in China understood by a broader audience by providing an overview of air pollution legislation. We present a variety of pieces of legislation at national, local, and international levels, including the Constitution, national laws, national administrative regulations and departmental rules, and local regulations and rules that were selected because of their direct and close relation to the prevention and control of air pollution. We describe history of legislation since 1956 till 2018, and the 12th Five-Year plan on Prevention and Control of Air Pollution in Key Regions, and a series of policies on energy conservation, emission reduction, and energy use. Then comment on challenges of defects within the legislation framework and integration problems among legislation, plans, and policies. Finally, we put forward some improvement measures to address the challenges.*

KEYWORDS: Air pollution, legislative mechanism, environmental policy,

INTRODUCTION

As the world's second-largest economy, China is going on suffering from environmental pollution, especially for ambient air pollution, which has become a major threat to public health; Compared with the pollution condition of other environmental media, air pollution in China is becoming more and more serious and has aroused great attention for the frequent haze events in recent years [1]While the majority of people are aware of the pollution hovering atop China's eastern coast and throughout their waterways, they are largely unaware of the policies and implementation efforts of the Chinese government to reign in these threats. The Chinese National Ambient Air Quality Standard (CNAAQS) for PM10 and PM2.5 exceeded in many cities of China in 2015. Based on scientific evidence for the evolution of air pollution and the institutional background of environmental governance in China, we examine the development of air pollution control policies from the 1980s to onwards. The early policies, until 2005, were ineffective at reducing emissions; during 2006–2012, new instruments which interact with political incentives were introduced in the 11th Five-Year Plan, and the national goal of reducing total sulfur dioxide (SO2) emissions by 10% was achieved. However, regional compound air pollution problems dominated by fine particulate matter (PM2.5) and ground level ozone (O3) emerged and worsened.In 2013 air pollution control policies have been experiencing significant changes on

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multiple fronts. The average annual O3 concentration was increasing during 2013–2015, and 16% of the total cities in 2015 did not meet the CNAAQS. PM2.5, PM10, and SO2 concentrations are higher in northern than in southern regions. Secondary particles formation and motor vehicle exhaust were the main sources of PM2.5 in megacities. Dust was the main source for PM10. In this work we analyze the different air pollution legislation, the drivers of changes and key factors influencing the effectiveness of legislation. Air quality in China ranked the second to last in 180 countries, only better than Bangladesh[2] . Although reduced emissions have improved air quality in China, heavy pollution events occurred frequently.

The air pollution problems, while being addressed by various economic instruments and environmental technologies, are related to imperfect legislation and potential integration problems among legislation, plans and policies from the perspective of legislation, planning, and policy-making. One example of the legislation imperfectness is the absence of national laws and administrative regulations on the prevention and control of particulate matter (PM), especially fine particles (PM2.5) that contributes to the smog and haze.

Legislation framework for PCAP in China

Along with the National People's Congress (NPC) and its Standing Committee other government authorities are also responsible for passing all national laws[3] . According to the Law of China, legislation at the national level includes the Constitution, national laws, national administrative regulations, and departmental rules, while legislation at the local level mainly includes local regulations and rules. The legal documents considering the air pollution in China have a direct and close relation with PCAP, especially with the prevention and control of PM, which is generally considered to be the main contributor to smog and haze. Article 26 of the Constitution provides that the state protects and improves the environment, and prevents and controls environmental pollution and other public hazards. The 2014 Environmental Protection Law provides in Article 42 that companies, public institutions, and other producers that discharge pollutants should take measures to prevent and control the pollution and harm caused to the environment by waste gas, dust, odorous substances, etc. generated in production and consumption activities.

The Environmental Protection Law provides a legal framework for PCAP by stipulating general environmental quality and pollutant emission standards, pollutant emission permission, and environmental monitoring. The APPCL is the only specific national law for PCAP. It contains 7 chapters and 66 articles. The APPCL mainly stipulates systems for total air pollutant load control (TAPLC) and permission, illegal excessive emissions of pollutants, and pollutant emission fees. It specifically regulates various sources of air pollution, including coal combustion, motor vehicles and vessels, waste gas, dust, odorous substances, soot in the catering-services industry, and ozone-depleting substances. In addition, other national environmental laws are closely related to PCAP. The Cleaner Production Promotion Law takes steps toward reducing and avoiding air pollution by promoting cleaner production and improving energy efficiency. The Environmental Impact Assessment Law aims at preventing air pollution through environmental impact assessment of plans and construction projects. The Energy Conservation Law establishes a strategic position of energy conservation in Chinese energy development, calling for economic

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structural adjustment and energy-efficiency improvement to lower carbon dioxide intensity of the economy. The Forest Law emphasizes protection of forests, which also contributes to maintaining the ambient air quality. National administrative regulations and departmental rules [4] Many implementing regulations of PCAP are accompanied by national laws and explain national laws in more detail. For instance, the Regulation on Levy and Use of Pollutant Emission Fees makes detailed stipulations about the checking and verification of types and quantities of air pollutants; the standards, methods, and procedures for levying pollutant emission fees, the use of pollutant emission fees, and the legal liability of non-complying polluters. Several ministries and commissions under the State Council are also authorized to issue rules, which occupy a less prominent place than enactments of the State Council itself in China's complex hierarchy of legal norms[5] . Rules for PCAP are issued mainly by the Ministry of Environmental Protection (MEP) cooperating with other ministries within their respective areas of responsibility for environmental protection. According to the Standard Law of China, the environmental quality standards stipulated by the MEP must be enforced. The 2012 Ambient Air Quality Standards (GB3095-2012, hereafter referred to as "the 2012 Standards") undertakes significant measures toward PCAP. On one hand, the 2012 Standards set control standards on two new pollutants (ozone and PM2.5) and tighten limits of respirable suspended particles (PM10), nitrogen dioxide, and other pollutants. Accordingly, the 2012 Standards call for an improved automatic monitoring system. At the international level, China joined international environmental treaties relevant to PCAP, such as the Vienna Convention for the Protection of the Ozone Layer (1985) and its follow-up document, the Montreal Protocol on Substances that Deplete the Ozone Layer (1987), with the purpose of controlling or prohibiting destruction of the ozone layer. Generally if differences in provisions exist between an international treaty concluded or acceded to by China and Chinese laws, provisions of the international treaty shall apply unless they have been announced to be reserved.

Legislation History for PCAP in China

The legislation for PCAP in China started since 1956 till to date. The Decision on Preventing Silica Dust in Mining Companies (1956) promulgated by the State Council was the first legal document for PCAP in China; it was designed to reduce harm to workers caused by silica dust during mining. The Cultural Revolution (1966e1976) significantly affected Chines economy and society, resulting in the stagnation of legislation. Legislation for PCAP revised in 1972 when China attended United Nations Conference on Human Environment and the Chinese government thus took its first step in PCAP and promulgated legal documents focused on eliminating soot pollution in industrial companies. The Environmental Protection Law (1979) indicated the beginning of China's environmental law system [5]. In the field of PCAP, the Forestry Law and APPCL were promulgated in the 1980s. The 1987 APPCL established a broad but vague framework for PCAP [6] . It provided that the Environmental Protection Bureau (EPB) should strengthen supervision and management of PCAP in companies and required air pollution monitoring, emission declaration and registration, and fines to be levied for exceeding air pollutant emission standards The 1987 APPCL was responsible for a slight reduction in the concentration of total suspended particulates in the 1990s [7]. The 1995 APPCL took a relatively small step in PCAP by popularizing cleaner production technologies, controlling the sulfur content of coal, establishing acid-rain control areas, and prohibiting leaded gasoline [6]. The

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1995 APPCL thus was revised again in 2000 and a series of specialized administrative regulations and rules for PCAP were issued, e.g., Administrative Regulations on Levy and Use of Pollutant Discharge Fee. The revised APPCL included the advanced idea of sustainable development and also adopted several provisions that lawmakers had sought but failed to get approved in the 1995 APPCL[8] . It strengthened regulation of emissions from vehicles and vessels, including banning the manufacture, sale, or import of vehicles and vessels that did not meet environmental standards and barring the use of vehicles that failed to meet the effective standards at the time of their production. As well as intensified the punishments to be imposed on non-complying polluters. The control on SO2 emissions has played an important role in preventing and controlling air pollution caused by coal combustion [9]. Nonetheless, legislation for PCAP had obvious characteristics of "command and control regulation" and completely ignored possible self-regulation by the regulated, which was an important factor to relatively poor implementation in practice[10] .

The 2014 Environmental Protection Law added several measures for PCAP, including TAPLC, pollution prevention by coalitions for cross-administrative district pollution, information disclosure and public participation, and daily penalties. It borrows from the United States' experience of regional environmental management mechanisms for PCAP; for example, pollution prevention by coalitions for cross-administrative district pollution changes from point-source control to regional coordination and joint prevention and control, which just right targets resolving the current air pollution [11]. Other supporting legal documents for PCAP is 2012 Standards and rules; brought the major pollutant PM2.5 into the scope of pollutant control standards and compulsory monitoring for the first time, manifesting a significant step directly toward prevention and control of PM2.5. Accordingly, the MEP proposed a four-phase implementation plan, and the 2012 Standards will be implemented nationwide on January 1, 2016. Specifically, the MEP and its subordinate EPBs at all levels are responsible for enforcing the 2012 Standards, and their main enforcement measures are monitoring and evaluating ambient air quality according to new standards and providing information about ambient air quality to the public[12] .

Plans for PCAP in China

The Chinese government has developed a Five-Year Plan (FYP) for Economic and Social Development every five years since the Maoist era. The FYP lays out China's development strategies, clarifies the government's working focus, and provides guidance for the activities of major market actors [13]. Originally, the goals and measures of FYPs were focused on economic development. With the deteriorating environment, environmental targets and measures, including those for PCAP, have been added into FYPs in recent years. The expression of economic development in the 11th FYP (2006e2010) changed from "faster and better" to "better and fast" for the first time. In addition, Part VI of the 12th FYP (2011e2015) specially addresses green development, development of an energy-conservative and environment-friendly society, and proposes guidelines for PCAP. [14]It states that China should significantly reduce the energy intensity of the economy and carbon dioxide emissions as well as effectively regulate other emissions of greenhouse gases (GHGs), prioritize solutions for air pollution that adversely affects people's health, expand the scope of controlled major air pollutants, tighten standards for

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pollutant emissions, set up a polluter-pays system and complete its accountability system, and strengthen supervision of law enforcement. The 12th FYP structures the national planning system for PCAP. According to the 12th FYP, Chinese government agencies developed plans for PCAP at lower levels. The 12th FYP on Prevention and Control of Air Pollution in Key Regions, worked out by the MEP, was approved by the State Council in 2012.

This is the first time that the Chinese central government has issued a comprehensive plan for PCAP, indicating that the goals of PCAP in China have gradually changed from TAPLC to environmental quality improvement, and from being focused on prevention and control of primary pollution to both primary and secondary pollution. However, the ambient concentration targets may be hard to achieve, considering several adverse factors: limited time, limited local capacity in terms of government and research institute staff, and lack of experience on ambient air quality management[15]. The major air pollution episodes of late 2012 and early 2013 drew widespread attention. Then the State Council issued the Action Plan on Prevention and Control of Air Pollution in 2016. In what has been called the most stringent plan for PCAP in the history of China, the Action Plan builds on the 12th FYP for PCAP in Key Regions.

Table 1
China National Action Plan on Air Pollution Prevention and Control (2013–2017)

Air Quality Improvement Goal	
1.	By 2017, the urban concentration of PM_{10} shall decrease by 10% compared with 2012; annual number of days with fairly good air quality will gradually increase
2.	Concentration of $PM_{2.5}$ in the BTH, YRD and PRD regions shall respectively fall by around 25%, 20% and 15%
3.	$PM_{2.5}$ annual concentration in Beijing shall be controlled below 60 mg/m^3
Ten Tasks	
1.	Increase effort of comprehensive control and reduce emission of multi-pollutants
2.	Optimize the industrial structure, promote industrial restructure
3.	Accelerate the technology transformation, improve the innovation capability
4.	Adjust the energy structure and increase the clean energy supply
5.	Strengthen environmental thresholds and optimize industrial layout
6.	Better play the role of market mechanism and improve environmental economic policies
7.	Improve law and regulation system. Carry on supervision and management based on law
8.	Establish the regional coordination mechanism and the integrated regional environmental management
9.	Establish monitoring and warning system. Cope with pollution episodes
10.	Clarify the responsibilities of the government, enterprise and society. Mobilize public participation

The Action Plan for the first time sets quantitative air quality improvement goals for key regions within a clear time limit and lists ten key actions covering all the major aspects of air quality management (Table 1) from this Action Plan various policies have emerged. The “total control” of SO_2 and NO_X is strengthened and accelerated. As vehicles are important contributors to NO_x, the early retirement of old vehicles is also emphasized. The 12th FYP is coming to an end and its total emission control goals [16] for major pollutants have already being achieved in advance or are about to be reached. MEP coordinated the signing of provincial action plans between central and provincial governments. Provincial action plans have similar structure compared to

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the nation one, including firstly the provincial air quality improvement goals and then a list of measures. Many standards are being updated, including air quality and heavy pollution alerting index systems, emission standards of power plants, boilers and vehicles, fuel quality standards, technical specifications of emission monitoring and accounting. Air quality monitoring regional networks are being built [17]. Regional cooperation mechanism is taking substantial steps: Based on previous experiences, specific cooperation tasks being proposed and prepared include "joint emergency handling mechanism for serious pollution weather", "couplet assistance" between Beijing, Tianjin and less developed cities in Hebei Province, "joint monitoring and enforcement" of regional pollution issues such as straw burning, fuel quality and vehicle exhausts[16]. Revising law and enhancing enforcement: A dozen of "serious cases of environmental damage" subject to criminal penalties are made explicit [18]. In 2014 more than 8000 suspects were arrested in more than 2000 environmental criminal actions, an amount which is twice the number of cases in all the previous 10 years [16]. The Environment Protection Law was amended in 2014. From the legal liability perspective, fines on illegal discharge are now imposed consecutively on a daily basis without a cap. In the first half year of 2015 after the new law coming into force, cases found applicable to several new penalty measures have been doubling and tripling on a monthly base[19] . Other specific laws on air, water and soil are under revision but the process is not as smooth as the revision of the basic law. Public participation and civil society's role is increasing: Litigation qualification for non-governmental actors is defined in the new law. Around 300 environmental "social organizations" are qualified to file litigation to the people's courts. Information disclosure started from public available real-time air quality monitoring data, and now expands to pollution source related data such as records of enterprises' penalties. In some provinces, the EPBs are reported as mobilizing in a campaign style to innovatively disclosure information and promote public participation in supervision and reporting of environment related illegal practices. For pollutants, pollution fees are to be changed into pollution taxes as reflected in the Environmental Protection Tax Law (draft for soliciting opinions, released in June 2015). The National Development and Reform Commission (NDRC) has been leading the preparation of tradable carbon permits. The Ministry of Finance has been involved in designing a carbon tax.

The Action Plan may have high chance of being implemented since it will be enforced through the Communist Party's personnel evaluation and promotion system for high level officials.[13].

Policies for PCAP in China

A series of policies favorable to PCAP have been proposed and implemented in China [20], these policies are mainly focused on energy conservation and emission reduction, and energy use, which are important guiding measures for decreasing air pollution by addressing its root causes. The first Policy Outline of Chinese Energy Conservation (1984) systematically described the technological policy of energy conservation in industry, commerce, and transportation in both urban and rural areas. In 1994, the State Council issued the Framework of National Industrial Policy of the 1990s, which required vigorously and continuously developing tertiary industry that is considered to be less air pollutant intensive than the secondary industry[21] . During the Fifth Session of the Tenth NPC in March 2007, as far as energy-use policy is concerned, the government has taken measures for subsidies, taxes, prices, and loans to encourage use and development of cleaner energy, to reduce consumption of traditional energy resources such as

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coal and petroleum and mitigate air pollution. As for subsidies, one study [22] indicated that it is essential that the government give finance support to environmental improvement. An empirical study on Chinese subsidies for renewable energy[23] indicated that, macroscopically, subsides have promoted development of the renewable energy industry, especially by expanding production volume; microscopically, subsidies will not affect innovative capacities of renewable energy companies and have a positive effect on profitability and market capabilities of these companies. Nonetheless, subsidies may result in overexpansion and overinvestment of the renewable energy [24] and may cause financial pressure on the government in the long run. With regard to taxation, policies for reduction or exemption of income tax and value added tax have been applied to the renewable energy industry.

Challenges

Although a system of legislation, plans and policies for PCAP has been established in China and has played an important role in protecting China's ambient air quality, the system still has defects. The challenges of legislation, plans, and policies for PCAP, contradictions and conflicts among legal documents as well as among the legislation, plans, and policies, based on the conceptualized principles and criteria of an integrated policy system.

Legal Loopholes in prevention and control of motor vehicle pollution

The current APPCL does not consider the prevention and control of motor vehicle pollution: the responsible department or supervision and coordination department, declaration and registration, pollutant emission permits, collection of emission fees for motor vehicles, and driving restrictions of high polluting vehicles. Although the MEP and other ministries issued the Rules on Supervision and Management of Automobile Exhaust Pollution (1990) and Rules on the Standard for Compulsory Retirement of Motor Vehicles (2013), the effectiveness of departmental rules is lower than that of national laws and administrative regulations. In other words, departmental rules lack the high authority of national laws and administrative regulations. The legal documents for prevention and control of motor vehicle pollution within the legislation framework for PCAP still have internal consistency problems.

Lack of Specification about the TAPLC system

Section 1 of Article 15 of the APPCL only provides the TAPLC system in specific areas, which has been insufficient to deal with the current situation of serious national air pollution. Nitrogen oxides should also be considered for inclusion in the TAPLC system. To summarize, current specifications about the TAPLC system are not comprehensive and cannot achieve the targets of PCAP.

Outdated Provisions of the air pollutant emission permit system

Provisions of the air pollutant emission permit system are outdated. According to Section 2 of Article 15 of the APPCL, local governments are empowered to check and verify the total amounts of air pollutants emitted by companies and institutions and issue pertinent air pollutant emission permits. In other words, local governments should directly carry out such tasks. Nonetheless, the tasks are actually undertaken by EPBs at various levels, and local governments rarely intervene. Hence, provisions of the APPCL are not consistent with practice.

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Lack of specification in the air pollutant emission trading system

Many Chinese provinces have issued local regulations and rules for the air pollutant emission trading system and launched pilots of air pollutant emission trading, while national laws and regulations for PCAP, especially the APPCL, have not stipulated the principles, procedures, etc. of an air pollutant emission trading system. This is obviously a comprehensiveness problem.

Ambiguity among governmental responsibilities for PCAP

Article 3 of the APPCL vaguely requires local governments at various levels to be responsible for ambient air quality within the areas under their jurisdiction. However, it does not specifically stipulate how local governments are responsible for local air quality, and further how such responsibilities are evaluated. It is also not clear who should be accountable for legal responsibilities if local air quality cannot meet the 2012 Standards. Therefore, local governments and officials who favor economic development are inclined to neglect their responsibilities for protecting local air quality[25] Worse still, local governments sometimes require EPBs to reduce the collection of emission fees to protect the profits of local companies [26]. (Zhang et al., 2010).

Low penalties of violators

The low penalty of violators undermines the effectiveness and of legislation for PCAP, which hinders the legislation from preventing and controlling air pollution. Current emission penalties in China can be less than half of the cost of pollution-control facilities[27] .What is more, penalty amounts for persistent violations are obviously low and cannot effectively curb illegal activities, resulting in a dilemma of high compliance costs and low violation costs. Polluters would prefer to pay a fine in exchange for more emissions. The APPCL has more provisions about administrative responsibility, but fewer and incomplete ones about civil and criminal responsibilities [28].

Defective amalgamation among legislation, plans, and policies

Here are defective amalgamation among legislation, plans, and policies for PCAP. Objectives and measures for PCAP in plans and polices have not been incorporated into laws through legislation. Hence, they have no legal effects. Taking the Action Plan as an example, its proposed ambitious goals are thought to be extremely difficult to attain by scholars and the media [10]. There is also a consistency problem which refers to conflicts among legislation, plans, and polices for PCAP. For example, the regional TAPLC system stipulated by the APPCL is no longer consistent with existing energy conservation and emission-reduction policies.

Improvements

Improvement measures in legislation, plans, and policies for PCAP are proposed based on the challenges previous described.

Provisions for prevention and control of motor vehicle pollution

Considering the characteristics of motor vehicle pollution, the draft amendment of the APPCL has made major revisions in prevention and control of motor vehicle pollution. The measures mainly include reasonably controlling the number of motor vehicles; strengthening supervision and management of the compliance of newly produced motor vehicles, motor vehicles in use,

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and fuel quality with environmental standards; and limiting use of some motor vehicles on heavily polluted days. It should be noted that this last measure would restrict citizens' rights to travel and use vehicles; hence, its preconditions should be strictly and explicitly stipulated at the same time. Furthermore, it is necessary to give reasonable compensation for restricting citizens' legitimate rights[10] .

Empowering local EPBs to enforce the air pollutant emission permit system

It is appropriate to empower local EPBs to check emissions to the air, and issue air pollutant emission permits. The EPB would be more effective at enforcing the air pollutant emission permit system for two reasons. First, an EPB is more professional than the local government in issuing air pollutant emission permits. Second, an empirical study of local EPB operation found that local governments often still prioritize economic development and could not neutrally and fairly issue air pollutant emission permits to such polluters in practice. Nonetheless, despite belonging to the local government, an EPB can still maintain some independence and enforce pollution regulation more neutrally and fairly than the local government [10].

Improving viability of the air pollutant emission trading system

The air pollutant emission trading does not have obvious net effects on reducing air pollutant emissions, and this is due to profit-maximizing. Companies with a low cost of SO2 emissions are committed to reducing SO2 emissions and sell emission rights to increase revenues, while ignoring or even intentionally adding other pollutants. In contrast, companies with high costs of SO2 emissions, while also committed to reducing SO2 emissions, have a laissez-faire attitude to other pollutants not involved in trading, thus adding other pollutants[29] . For the implementation of air pollutant emission trading initial allocation of emission rights should be freely distributed,[30]. Second, EPBs should moderately regulate the emission trading market, including both performance of emission trading contracts and transaction procedures [30]. Third, both companies and EPBs should strengthen monitoring capacity by establishing appropriate online monitoring devices and a quota tracking system [31].

Clarifying government responsibility and intensifying penalties

As far as government responsibility for PCAP is concerned, Articles 4 and 11 of the APPCL draft amendment establishes a target responsibility system and an evaluation system for the whole [32]. These systems assess the degree to which local governments, EPBs, and their chief officers fulfill air quality protection objectives. They also require any municipal government not meeting national Ambient Air Quality Standards to prepare an air quality attainment plan and achieve air quality objectives within a time limit. However, stipulations of government responsibility for PCAP in the current APPCL draft amendment need to be embodied in more concrete provisions in administrative regulations or departmental rules. To resolve the problem of low penalties for violators in current legislation for PCAP, the latest draft amendment of the APPCL has incorporated measures strengthen legal liability for violations as well as inflict daily penalties on serious violations; while ignored the liability system and set up supporting civil litigation procedures for damages caused by air pollution.

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Coordinating relations among legislation, plans, and policies

Improvement measures can be taken among the legislation, plans, and policies for PCAP can be improved in the following ways.

- Article 15 of the draft amendment of the APPCL stipulates legal effects of an air quality attainment plan to achieve air quality objectives within a time limit. For regions that cannot achieve the objectives, the EPB and Supervision Department shall interview relevant local government officers and release the interview results. The EPB shall suspend the examination and approval of any environment impact assessment documents of a construction project that may increase total emissions of key air pollutants in the region. In addition, learning from the stringent Action Plan which stipulates performance evaluation indicators for provincial leaders, legislation can stipulate performance evaluation indicators for an air quality attainment plan and inflict harsher punishments on local leaders if their regions cannot achieve the objectives. In this way, measures can be implemented more effectively via enforcement of laws, and the objectives are more likely to be achieved.
- To ensure consistency among legislation, plans and policies, revision of PCAP laws should consider removing or revising the articles that cause the conflicts. For example, the draft amendment of the APPCL has expanded the TAPLC from two Control Zones to the entire country to match current policies on energy conservation and emission reduction.
- Considering the stability of legislation and flexibility of plans and policies, certain items temporarily unsuitable for legislation may be first implemented on a trial basis in the form of plans or policies.

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