# Study on Controlling Smog Pollution by the Man-machine Cooperation

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***Abstract***: *The man-machine cooperation is characterized by shared cloud storage, assessment of massive data, and machine algorithm decision-making, provides an important opportunity to control smog pollution. It is urgent to analyze the data based on the relationship between smog and health, build a global smog governance knowledge base through an intelligent data mining engine, and deeply analyze the omissions of relevant policies and legal regulations. It proposes that man-machine cooperation balances the multi-interest game in the management of smog, perfects the rules of smog areas and the rules when smog often occurs, steadily implements the law enforcement actions to combat the smog pollution, and strengthens the final protection of the smog management. Constructing a grand blueprint for public health, economic development, social stability and ecological harmony, etc.*

***Key words***: *smog pollution; governance model; man-machine cooperation*

## Introduction

Under the concept of shared development in the new era, the essence of "Do more to improve the lives of people and address their concerns" (Xi, 2018) is to guarantee the survival of the people. As the disturbing ecological disasters gradually increased, the multi-form, high-aggregation, complex and associated smog pollution is decomposing and breaking social integration and cohesion silently under the continuous action of the Earth's environmental causality. In fact, the most serious consequences of the damage is often borne by the poorest people. Smog governance is currently one of country's major livelihood projects.

At present, China's energy structure adjustment, industrial layout transfer and economic model changes have initially improved the overall situation of smog, but failed to effectively curb the spillover effects of local pollution. On the one hand, high-tech has revealed the inherent tension that motivates people to get rid of material containment; on the other hand, it has the inherent flaws that cannot see the mysterious and multiple connections between things. It is urgent to construct a green governance model with stability, science, long-term and overall. Through man-machine cooperation and innovation power intervention path, strictly follow the benign balance of the law of bio-accumulation, and steadily improve the quality of life of the human race.

## Positive Effects of Man-machine Cooperation in Managing Smog Pollution

As early as 1956, pioneers such as Shannon, Minsky, and McCarthy pointed out that the hypothesis of

artificial intelligence research can be accurately described in every field of knowledge, so that machines can be built to simulate it (Zhang, 2020). In recent years, technical applications such as artificial intelligence assisted government systems, artificial intelligence assisted public security systems, artificial intelligence assisted arbitration systems, and artificial intelligence assisted correction systems have been launched. It has rapidly improved the process of man-machine cooperation to promote the orderly, rationalization and modernization of public rights in China.

China's smog treatment focus on improving the quality of the atmospheric environment. It faces complex and unpredictable atmospheric conditions, scattered and concealed illegal discharges, and prominent contradictions between promoting regional economic development and controlling pollution emissions, etc. It is urgent to construct an intelligent analysis model of smog conditions that is characterized by replacing some complicated mental labor. Relying on accurate and huge amounts of data to build an intelligent support system that promotes transparent and rational adjustment, such as the intentions, implementation, non-compliance costs and relief channels of smog governance policies and regulations. "Ensuring substantive justice and procedural justice" (Zhang, 2015) and to build an orderly pattern of green management of smog pollution in the new era.

## Intelligent Analysis of Smog Conditions to Promote Optimal Prevention

Constructing a new generation of man-machine cooperative analysis model based on smog big data, and automatically collect and feedback air quality data, resident health data, and other environmental factor data such as water quality and soil by real-time processing of massive sensors radiating urban areas and vast rural areas. Long-term (rather than short-term research), true (rather than subjective), comprehensive (rather than selection of samples) to master the laws of smog change and to integrate economic data, political data and cultural data in the corresponding regions of the same period, etc. Accurately excavate the interaction between smog pollution and public physical and mental health, water cycle, acid deposition and even climate change will provide an important scientific reference for the comprehensive improvement of smog prevention policies and regulations and orderly case trials.

## Intelligent Retrieval of Smog Governance Data Promotes Transparency and Rationality

Establishing an intelligent retrieval system for smog governance data, which collects and stores relevant policies and regulations, execution cases, judgment documents and other relevant academic literature and practical materials extensively. It will provide an intelligent inquiry service and analysis platform for the national public authority and its staff, many stakeholders in governance activities, relevant universities and research institutes, and the public. Comprehensively popularize the knowledge of green governance, help the public understand the background, intentions and connotations of relevant rules, public implementation and transparent relief channels, and help potential pollutant enterprises and individuals to rationally calculate the cost of violations. And it is motivated to abandon bad behavior based on accurate predictions of negative consequences, and improve the scientific, effective, orderly and rationality of smog governance.

## Intelligent Handling of Smog Pollution can Help to Settle Disputes

For a long time, the core problem of realizing orderly control of smog pollution is the difficulty of obtaining evidence and the violation of regulations caused by improper attribution. The integrated man-machine cooperation of smog pollution disposal mechanism has super strong memory, retrieval power and error correction ability, which will not only help the inspectors to find the real-time changes of harmful factors in the production environment and continuously cluster the objective evidence of zero dead angle in a timely and convenient manner, quickly understand the excessive emissions of motor vehicles and non-road mobile machinery, quickly accept and feedback public reports, and will also help the public authority to accurately allocate sudden and long-term smog damage liability. In particular, the multi-element unified interaction assessment is based on case data, survey data and court trial data, scientifically outlines the dynamic relationship between the case violation cost and illegal income, and then flexibly adjusts the execution. It not only avoids the erroneous ruling of the subject of power due to subjective prejudice or lack of knowledge, but also eliminates the irrational responsibility of the polluters, and does not promptly carry out pollution autonomy or the unreasonable responsibility to maintain unreasonable phenomena. It will urge the public to respect and consciously maintain the green smog controlling strategy in the new era.

## Outline the Man-machine Cooperation Scheme for Smog Governance

China's economic construction has achieved remarkable achievements. "A total of 250 million poverty-stricken people have been reduced, basically solving the problem of food and clothing for residents" (Yu, 2014). Health is the basic guarantee for the dignity of the human race. The fundamental purpose of China's active implementation of smog governance is to guarantee and develop the fundamental interests of the people, respect and guarantee basic human rights, and emphasize that the formulation and implementation of governance rules must truly reflect the common interests of the masses of the people at present stage, and take into account the special interests of different groups. Seeking the dynamic balance of economic games, residents' health and convenience of life. It is urgent to implement the concept of innovation, coordination, green, open, and shared development, and actively outline the man-machine cooperation program of the smog management that continuously enhances the public's physical fitness and health literacy.

## Man-machine Cooperation to Reconstruct the System of Smog Governance Rules

(1) Man-machine Cooperation to Analyze the Correlation Index of Smog and Health

There is not enough basic data and technical output to strongly support the high correlation between ecological environment and public health. The fuzzy correlation between smog pollution and residents' health makes the formulation of macro-governance rules and micro-instance processing often in a state of sway. It is urgent to accurately analyze the correlation index of smog and health through man-machine collaboration, and to make scientific basis of smog governance. The multi-pathway of the iterative transition and intelligent tracking technology for indoor and outdoor permeability coefficient of multi-media smog particles, accurate and sensitive intelligent detection and analysis technology of smog pollution population exposure, fast and cheap intelligent algorithm for deducing health risk grading technology in heavily polluted areas, and wide-

area coverage of smog pollution and health information intelligent sharing technology, which are applied to accurately track regional atmospheric environmental quality data and health data of corresponding populations. By comprehensively assessing the correlation index between each other, helps the public authorities to determine actual hazards caused by smog pollution, and make the practice of governance more rationally coordinate economic development, atmospheric environment and public health.

(2) Man-machine Cooperation to Mine Smog Governance Data and Rule Gaps

The public authority has obtained knowledge insights from experts and scholars in the fields related to global smog pollution through an intelligent mass information mining engines. According to the risk source distribution of intelligent exploration, the actual situation of major toxic and harmful pollutants, the main exposure route and distribution characteristics of the population, the knowledge base of smog management is constructed according to the specific format in the man-machine cooperation platform. Following the heuristic principles and precise procedures to deeply analyze the absence of current governance rules and the logical deviations and incompatibility between different policies and regulations. Through the enrichment of multi-dimensional influence variable simulation training, the comprehensive comparison of the resources invested in smog management can significantly reduce the time, manpower and material resources of the national level and local governments in the investigation and demonstration in the construction of rules. Targeted improvement of atmospheric environmental quality standards, air pollutant discharge standards, corresponding environmental impact assessment systems, sewage permit systems, air pollution damage compensation systems, atmospheric environmental quality performance evaluation methods, and related information sharing and risk communication mechanisms, making smog governance rule system more pragmatic and efficient.

(3) Man-machine Cooperation to Improve Regional Rules and Special Rules for Smog Governance

China has vast territory, large population, complex and diverse geographical environment which led to differences in economic, political, cultural and natural conditions in different regions. Although the ‘Air Pollution Prevention and Control Plan’ was promulgated and the ‘Air Pollution Prevention and Control Law’ was newly revised, provinces, autonomous regions, municipalities directly under the Central Government and even second and third tier cities have introduced implementation rules, which have increased the proportion of designated cities and the number of days of compliance, and reduced the frequency and intensity of major pollutant concentrations and heavy pollution weather. However, it has not fundamentally solved the serious smog pollution in key areas. For example, the joint prevention and control actions of the Beijing-Tianjin-Hebei, Yangtze River Delta, and Pearl River Delta regions have not been effectively carried out due to lack of supporting policies and regulations, so it is urgent to construct a unified and coordinated regional rule system. In fact, the separation of local administrative power and financial interests is a huge obstacle to the smooth implementation of the joint prevention and control of smog pollution. In the absence of clear standards and accurate data support, it is difficult for level departments to reach an agreement. They can only rely on the central government temporarily gives vertical recommendations in the open campaign to complete the basic tasks of joint prevention and control in key areas. It is not conducive to fully mobilizing human, material and technical resources, and it is more difficult for non-key areas to form a harmonious co-governing atmosphere. The key areas under the application of artificial intelligence technology should actively cooperate with

science and technology enterprises to set up an open and shared smog trace data repository(such as particle composition and photochemical monitoring data resource pool in Beijing-Tianjin-Hebei and surrounding areas), reflecting the air quality situation and smog pollutant discharge status of the whole region objectively, fairly and in a timely manner. Through man-machine cooperation, it is possible to integrate financial funds and elite talents, and quickly obtain the specific conditions of the distribution of smog pollution sources and people exposed to pollution, and accurately predict the smog trend. Adhering to the goal of optimizing the atmospheric environment protection and minimizing the cost of prevention and controlling, we will deeply analyze the economic development data and smog governance data of the region. Simultaneously, taking into account the precise deduction of intelligent algorithms and the brain wisdom of the participating subjects. Relatively fair regional integration of atmospheric environmental quality standards, total atmospheric pollutant discharge standards, specific provisions for sewage charges and energy consumption regulations will be formulated to construct an ecological compensation mechanism that is intelligent and balanced. Through calculation and analysis of massive data, we can accurately detect the benefit degree of the regions benefiting from the joint prevention and control of smog pollution in real time, and accurately evaluate the development opportunity replacement cost for the smog control in the underdeveloped areas. To ensure that all parties can assume the responsibility of governance that meets their own smog conditions and does not exceed economic affordability. And then establish a normalized regional sharing of benefits shard risks, and a harmonious mechanism of common development. China's smog management basically follows a spiral development path from loose to tight, from simple to complex, from suggestion to severe punishment. The annual pollution index of key areas is declining, but the frequency and severity of smog in autumn and winter have not decreased significantly, and some areas are even more serious. For example, last year was the ending of the first phase of the ten air pollution prevention and control measures. However, the Beijing-Tianjin-Hebei region has suffered severe smog since the beginning of the year. In fact, the improvement of policies and regulations for a specific period requires comprehensive consideration of the maximum capacity of the real-time environment, the realization of optimal peak production, improved motor vehicle travel planning, and meeting the basic needs of residents for winter heating. Based on real-time atmospheric environmental data, smog pollutant emissions data, motor vehicle travel data, resident health care data, associated cognitive data, the collection of corresponding illegal data and regional interaction mechanisms, artificial intelligence algorithm is used to carry out accurate and timely wide-area sharing and joint early warning, actively analyze the causes of pollution, sources of pollutants and intelligent simulation solutions, which provides important scientific support for the formulation of special rules for frequent occurrence of smog. The public authorities at all levels are based on accurate smog data analysis results and algorithms to predict the consequences of pollution regulation, and introduce policies and regulations that correctly grasp the relationship between power and rights, power and supervision, and rights and responsibilities. Its result in the supply of special rules for the management of smog in autumn and winter is consistent with the effective needs of society. And it will form an inter-regional joint rectification of illegal enterprises, supervise the emission reduction of elevated sources, improve the peak production system, and promote the optimal pattern of coal reduction. It helps to promote the environment optimization that everything gets its own way and lives its own way, and grows its own way.

(4) Man-Machine Cooperation Promotes Public Participation in the Formulation of Smog Governance Rules

Intelligent technology applications provide the public with a convenient channel to participate in the

formulation of smog governance rules. The smog governance involving public affairs and public interests requires the public to actively participate in monitoring and restricting the exercise of power, ensuring that government-led governance practices effectively guarantee social rights and interests. However, the construction of smog governance in China has been in a semi-closed state for a long time. The public can only learn about the policies and regulations issued by the relevant departments and the announcement of the state of the atmosphere, the announcement of the state of the air quality of enterprises and institutions, the "sports-style" law enforcement inspection and handling announcements, and partial referee documents. Intelligent technology is applied to network sites, mobile applications and instant messaging tools of department of public authorities and enterprise and public institution. Helping intelligent opinion expression and circulation platforms based on big data and cloud computing to greatly expand the public's access to smog pollution, construction and implementation of relevant policies and regulations. Helping to expose specific violations or communicating their own interests through various channels, and strongly curbing the fierce social conflict caused by smog pollution. Through the intelligent platform, the background and purpose, specific content and basis of relevant policies and regulations are promulgated continuously and timely, and the public's feedback on conflicts and contradictions in rule making is received and handled in a multi-faceted manner, and public participation in the formulation of smog governance rules is realized.

## Man-machine Cooperation to Ensure the Steady Implementation of Smog Control Measures

Although Article 7 of 'Atmospheric Pollution Prevention Law' affirms that producers and institutions such as enterprises and public institutions are the first responsible party for smog pollution and clearly stipulates specific scope of responsibility. However, China's practice shows that the specific implementation of smog governance policies and regulations is an arduous and complicated long-term project. Due to limited manpower and lack of material resources, the public authority often adopts a sudden 'sports-style' execution mode, which leads production operators to have a chance of luck and disguise in violation of regulations. In addition, smog management is a complex task that integrates a wide range of knowledge in the natural sciences and social sciences, but most practitioners are not compound talents. It leads to the lack of strong support of execution system for accurate smog control.

The intelligent implementation system of building and perfecting the smog policies and regulations is to provide decision-making basis for public authorities and its staff by virtue of the vast knowledge reserve capacity of machine intelligence. Through high-quality and pragmatic improvement of intelligent monitoring index system of natural resources, intelligent smog monitoring system and effective evaluation system for smog management, etc. We can quantitatively judge and investigate the responsibility of the implementing agencies and their personnel for improper disposal of the atmospheric environment and major smog incidents, and urge high-polluting industries to install automatic monitoring equipment and carry out corresponding work. The aggregation application of intelligent technology also provides automatic monitoring stations for atmospheric environmental quality in 1436 cities for public authorities by mass-network sharing. It comprehensively analyzes the feedback data of enterprise monitoring equipment, self-built monitoring stations and massive sensors all over the country. It will help the public authorities to timely discover violations, save relevant evidence and make accurate punishment decisions, and effectively guarantee the

unity, integrity and authority of the implementation activities of the policies and regulations on smog control. Gradually forming a virtuous circle of potential violators who are unwilling to violate regulations, unable to violate regulations and dare not violate the rules.

Moreover, the ‘Environmental Protection Law’, ‘Air Pollution Prevention and Control Law’, ‘Interim Measures for the Management of Emergency Response Plan for Environmental Emergencies’ and ‘Air Pollution Prevention and Control Action Plan’ jointly established the institutional guarantee for smog emergency management. However, the differences in administrative powers and the imbalance of economic development have led to the lack of horizontal collaboration between the various regions in the unified emergency plan and its operation, and it is difficult to form a strong leadership core. The lack of expertise and experience for the staff of public authority and social assistance forces has become a major obstacle to scientific decision-making and rational guidance. It is urgent to set up an emergency assessment system based on the feedback data of massive sensors to accurately evaluate issues such as organizational size, personnel status, material supply and financial fund protection. In particular, the types, quantities and methods of materials for emergency storage are adjusted in an instant and accurately. And the enterprises that perform emergency output reduction and production reduction are reasonably compensated according to the results of intelligent calculation, and the sustainable development of the industrial economy is maintained. After each implementation, the machine system objectively evaluates the phased air quality monitoring data and pollution source emission data, and the emergency plan is designed according to the situation of different industries. For example, intelligent planning and deployment of public transportation and private car arrangements for motor vehicles in large and medium-sized cities not only meet the needs of public travel, but also achieve the goal of smog management. Besides, the orderly arrangement of volunteer teams in various places and the reduction of manpower input for pollution control and order maintenance through intelligent planning, which is conducive to alleviating the serious shortage of current emergency response resources.

## Man-machine Cooperation, Smog Management, Final Barrier

Judicial relief from smog pollution is the ultimate guarantee for the protection of the rights and interests of the injured. Such litigation are often related to major interests, harming unspecified objects, potentially for harmful consequences beneficiaries, complex and diverse in specific cases and difficult to repair rights. The current policies and regulations are not clear about the participation groups and forms of participation, and only the public authorities bear the responsibility for smog governance, resulting in the public's weak awareness of the responsibility for smog governance. The lack of relevant information disclosure, sharing and supervision feedback mechanisms also affects the effective exercise of the public's right to know and participation. The frequent changes in the allocation of burden of proof and the use of certification standards, as well as the lack of scientific and reasonable loss assessment systems and the standard of decontamination expenses, have seriously affected the necessary transformation of smog governance from non-mandatory administrative measures to mandatory and punitive norms.

The penetration of intelligent technology into the judicial field is an important trend in China's related construction, which greatly enhances the quality and efficiency of trials, promotes the increasingly unified legal application of case adjudication, and provides more efficient and more advanced judicial services to the

public. It is urgent to use information technology to establish a data resource pool that strictly monitors the smog conditions and implement it. To strengthen resource integration and service cooperation with relevant departments and enterprises, and fully develop the smog judicial service intelligent platform for relative judicial services, fairly and reasonably divide the relevant responsibilities of different subjects, and establish and improve the certification standards and performance mechanisms for insurance compensation and relief. And accurately calculate the specific compensation amount for personal injury and material damage caused by smog, so that the provisions on smog pollution responsibility are implemented. For example, the continuous improvement of intelligent diagnosis and treatment technology has greatly increased the possibility and accuracy of judging the relationship between smog pollution factors and diseases, especially helping to judge the causal relationship between damage with a certain incubation period and smog pollution, effectively eliminating the causes caused by personal physical factors, improving the accuracy of smog damage scientific judgment, increasing the credibility of judicial decisions and reduce unnecessary conflicts between litigants. Another example is that the improvement of intelligent analysis technology objectively provides favorable conditions for the development of the smog pollution liability insurance system, and helps the state to introduce a compulsory insurance system after listening the insurance company's accurate actuarial insurance rate and claims expenses. Through strict punitive measures, the policyholders are urged to actively protect the atmospheric environment. The responsibility of the powerful insurance company to fulfill the ruling results of smog pollution dispute, improve the public's confidence in the final barrier of smog governance, and promote the full implementation of the governance objectives.

## Conclusions

The public is the main force for effective control of smog pollution. As the living standards of our residents continue to increase, unreasonable consumer behavior brings tremendous pressure on resources and the environment. The unified and coordinated air quality index and air pollutant emission index based on big data technology can accurately and timely report pollution status, violations and governance. The corresponding intelligent smog governance information push and illegal reporting events. It is conducive to cultivating public awareness of atmospheric environmental protection, following green travel, using clean energy, reducing waste incineration, and so on. At the same time, the development and application of many intelligent technologies enables the public to choose a natural, economical, environmental-friendly and healthy lifestyle without increasing (or even reducing costs), and objectively helping the entire society to consciously fulfill its atmospheric environmental protection obligations. For example, the wide-area spread of shared bicycles facilitates green travel, DiDi taxis significantly reduce vehicle exhaust emissions, auto-sensing power equipment saves massive amounts of power resources, recycled paper and recycled fabrics to reduce deforestation and waste incineration.

From the end of governance to the source is an important characterization of China's smog governance model gradually becoming scientific and modern. The multi-industry-related man-machine cooperative production creates a smart mode of ecologicalization of industrial structure, production cleanliness, efficient resource utilization, and minimization of environmental impact. From high-input, high-consumption and high-emission extensive growth to green low-carbon, clean and safe intensive growth, unblocking resources, alleviating ecological pressure and promoting harmonious development.

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