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Research on the Logic of Mobile Governance from the Perspective of Path Dependency: A Case Study of the Implementation of the "Coal-to-Gas" Policy in Rural Areas of Handan

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ABSTRACT: Mobile governance, a commonly used governance approach in China, has always been controversial. Behind the persistence of mobile governance lies the underlying governance logic. This paper takes the implementation of the "coal-to-gas" policy in rural areas of Handan as a case study to analyze the path-dependent logic inherent in mobile governance. The paper argues that mobile governance's selection path embodies path dependency characteristics, including three paths: conformist path dependency, policy-based path dependency, and demand-based path dependency. Mobile governance can be regulated through three paths: formulating a comprehensive list of rights and responsibilities for grassroots governance, the provincial government enacting relevant regulations to standardize the grassroots governance process, and vigorously developing e-government and digital government technologies to enhance the rule of law and standardization in grassroots governance.

Keywords: Path dependence; Mobile governance; Credit-seeking goals; Blame-avoidance goals

1. Introduction

The 20th National Congress of the Communist Party of China pointed out the need to deepen the modernization of the national governance system and governance capacity, while mobile governance, as a common governance approach, has always been controversial. Some practitioners and scholars believe that mobile governance, as a governance approach deviating from conventional methods, is the root cause of many social conflicts and governance problems. They argue that mobile governance disrupts the legal framework and social order. On the other hand, others believe that mobile governance can address many intractable issues that conventional governance fails to resolve. Conventional governance is often hindered by local influences and protectionism, whereas mobile governance has the ability to rapidly implement policies at the grassroots level, thus potentially enhancing local governance effectiveness to some extent.

It is undeniable that mobile governance, as a governance tool, is often "used but not discarded". Mobile governance is not in binary opposition to conventional governance; it is a technical governance tool aimed at specific tasks. Mobile governance incorporates three mechanisms: triggering mechanisms, operational mechanisms, and sustaining mechanisms [1]. Moreover, mobile governance is compatible with China's overall governance environment, which provides numerous applicable scenarios and implementation grounds for mobile governance. The key to regulating mobile governance lies in ensuring that it is embedded in conventional governance while maintaining adherence to the rule of law, thereby improving governance effectiveness, maximizing the positive effects of mobile governance, and minimizing negative impacts.

This paper examines the path-dependent logic behind mobile governance by taking the "coal-to-gas" policy in Handan as an example. It analyzes the influence of three path choices—conformist path dependency, policy-based path dependency, and demand-based path dependency—on the selection of mobile governance tools. It also explores the

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psychological motivations of credit-seeking and blame avoidance in the context of mobile governance at the grassroots level. The conclusion proposes ways to standardize the process of mobile governance at the grassroots level.

2. Literature Review

2.1. Literature Review on Mobile Governance

Mobile governance is a widely prevalent organizational mechanism that encompasses various dimensions [2]. The "mobile governance" mechanism is a major corrective measure employed by the central government to address policy implementation deviations at the local level. By breaking away from the conventional bureaucratic process and replacing it with political mobilization, the central government can strengthen its policy concepts from top to bottom in a short period. Mobile governance aims to address implementation deviations in policy execution through a top-down approach: setting clear goals within a designated timeframe, providing supportive resources, conducting large-scale organizational mobilization, and, most importantly, establishing strict and detailed accountability mechanisms [3]. It plays a significant role in China's governance system, particularly in resolving economic and social issues when regular policy implementation fails to achieve the desired outcomes [4].

Scholars argue that for actual mobile governance to occur, three conditions need to be fulfilled simultaneously: first, the state must have a strong ambition for social transformation or face strong pressure for performance legitimacy, resulting in a more positive and even radical attitude towards social transformation; second, the state's fundamental power lags significantly, making it impossible for the state to achieve social transformation goals through institutionalized, conventional, and professional means, thus resorting to radical measures like movements; and third, the state holds considerable arbitrary power, allowing it to implement radical measures without the approval of society, which is unable to restrain it [2]. "Mobile governance" demonstrates clear characteristics of non-institutionalization, non-conventionalization, and non-professionalization in its operational approach. The consequences of "mobile governance" have a detrimental impact on social governance, with many social issues attributed to it. However, the emergence and development of "mobile governance" also have its intrinsic governance logic. Confronted with the scale and diversity of state governance, conventional governance mechanisms based on the bureaucratic system often prove inadequate, displaying signs of organizational loss of control and failure, whereas the mobile governance mechanism serves as an alternative or corrective mechanism that emerges in response to the failure of conventional governance mechanisms. In Chinese history, the two modes, conventional mechanism and mobilization mechanism, coexisted but with distinct primary and secondary roles: in most situations and periods, the conventional mechanism was the norm and held the dominant position; however, in specific historical periods, the mobilization mechanism became the driving force while the conventional mechanism was set aside, and even became the target of movements. The mobile governance mechanism has repeatedly emerged in Chinese history, not as a product of chance or individual will, but rather as a result of a comprehensive set of institutional arrangements and environment, constituting an essential component of the logic of the state governance system.

2.2. Literature Review on Path Dependence

"Mobile governance", a form of governance that surpasses conventional bureaucratic governance, is characterized by targeted and intensive actions [5]. As a result, the implementers have greater discretionary power, which is considered the root cause of many social issues, attracting significant criticism from the academic community. The most prominent criticism revolves around the issue of path dependency resulting from the misuse of mobile governance. Path dependency emphasizes the influence of structure and tradition on political behavior, where the heavier the weight of tradition, the more challenging it becomes to innovate institutions [6]. Path dependency theory has been extensively applied in social sciences such as economics, political science, and sociology. In the field of institutional change and path dependency research, previous studies on the causes and manifestations of institutional change have recognized path dependence as a crucial factor determining the direction of institutional change, as highlighted by North [7]. David and Paul. A [8] found that in the process of institutional change, once the institution fails to meet the proportion of resource allocation or address issues, the institution can be considered to have path-dependent characteristics. Path dependency theory has also been extensively discussed in the field of political science and political institutions. Richard Deeg's research on democratic consolidation is explicitly based on a rational choice framework, within which actors willingly face constraints imposed by history because they perceive the trade-off between short-term costs and long-term improvements. Therefore, path dependence is regarded as a result of rational cost-benefit calculations [9]. In contrast, Paul [10] described the relationship between European integration and the national parliaments as a process of

incremental change, equivalent to the concept of path dependence. Research on policy formulation in Finland specifically defines the mechanisms through which historical factors influence the policy process, although the conceptual model is sometimes unclear [11]. Raghu's study on path dependence provides a series of discussions on how positive feedback mechanisms permeate economics [12]. Raghu, Arun [12] are enthusiastic about demonstrating that potential multiple equilibria are constrained by suboptimality generated by positive feedback mechanisms, thereby "locking in" inferior technologies with limited opportunities to dominate.

As the research on path dependence theory deepens, more domestic scholars have joined the study. Research mostly focuses on theoretical and practical aspects such as institutional change, path dependence, and economic system reform. Based on the analysis framework of path dependence theory, Y.Liu [13] has mainly analyzed the logical structure and possible scope of application of path dependence theory and also elaborated on the advantages, disadvantages, and limitations of introducing path dependence into research on new institutional economics. D.Deng [14] believes that the main components reflecting the path dependence mechanism are institutional input costs, cognitive awareness, and reform policy strategies, and that the above three macro path dependence phenomena will directly affect the degree of adaptation of new institutions. J.Tang and H.Nian [15] believe there is a severe path dependence in the governance structure transition of state-owned enterprises, where the initial path continues to self-reinforce during the institutional transition process, leading to the locking of the governance structure of state-owned enterprises in an inefficient state. X.Li and Q.Hao [16] propose that influenced by factors such as inherent interest mechanism, property rights mechanism, and institutional transition costs, there are multiple path dependence phenomena and lock-in effects in the construction of ecological civilization institutions in China, resulting in insufficient effective supply of ecological civilization institutions in China. Y.Duan and R.Hou [17] explore the institutional transition model of path dependence and use path dependence theory to explain the unity of exogenous and endogenous factors in institutional transition, thus improving the lineage of institutional transition models. Path dependence is a dominant paradigm and discourse of historical institutionalism, which, while re-emphasizing the constructing role of institutions on individual behavior, focuses on the interactive influence between institutions and individuals. Historical institutionalism understands institutions as "stable, recurrent patterns of behavior", including formal institutions and their procedural norms emphasized by old institutionalism. Also, it incorporates informal rules and conventions into the category of institutions. According to historical institutionalism, institutions do not emerge in a vacuum. Instead, institutions gradually develop and establish in a context full of old institutions. Historical institutionalism explores what exactly happens in this process, with particular attention to the influence of old institutions on new institutions [18].

2.3. Literature Review on "Coal-to-Gas"

As global energy demands continue to expand, natural gas has played an increasingly significant role in the global energy consumption structure. Against this backdrop, foreign scholars have conducted extensive research on natural gas. Wahyu and Yuswan [19] assert that since the 1980s, Indonesia's demand for natural gas has rapidly increased, but its domestic gas production is insufficient to meet this demand. Therefore, Indonesia has adopted various models to address different situations in order to better satisfy the demand for natural gas supply. David [20] points out that energy subsidy reforms implemented by countries will lead to price increases and income reductions, potentially causing adverse effects in practice. Ladage and Blumenberg [21] believe that the "gas reform" carried out by the United States government has effectively improved greenhouse gas emissions. Yusoff and Bekhet [22] argue that better control of greenhouse gases requires enhancing energy efficiency based on practical circumstances and accelerating the transition from coal to natural gas and other energy sources. Khan and Zhang [23] note that clean energy can significantly reduce the negative environmental impacts, emphasizing the need for further innovation in clean energy. McKitrick [24] posits that shifting from coal to natural gas can effectively control greenhouse gas emissions.

In the 1990s, China made numerous attempts at the "coal-to-gas" project; however, due to an initial lack of experience in this field, various problems arose, impeding the development of the "coal-to-gas" process in the country. With the implementation of the Atmospheric Pollution Prevention Plan in 2013, "coal-to-gas" has gradually garnered more attention, leading to an increasing amount of research by domestic scholars on the subject [25].

Regarding issues and strategies in the "coal-to-gas" work, H.Liu [26] has identified primary problems in terms of economics, safety, and air quality control in the "coal-to-gas" work through analysis. X.Du, Y.Zhang [27] pointed out that the "coal-to-gas" work conducted in the Beijing-Tianjin-Hebei region has significantly improved the environment. However, there are still certain shortcomings in terms of pricing, policies, and technology. H.Li, R.Zhang [28] believe

that the insufficient supply of natural gas is the main issue in the process of implementing the "coal-to-gas" work, requiring measures to be taken in terms of pricing, policies, and others.

In the context of energy subsidies, S.Wang [29] analyzed the pricing of "coal-to-gas" using a specific calculation method and evaluation criteria, proposing relevant suggestions. Y.Xiong, W.Liao [30] analyzed the factors influencing the subsidy mechanism in the "coal-to-gas" project, and based on this analysis, they put forward a reasonable subsidy scheme. Regarding the technological and economic benefits of "coal-to-gas", J.Han, J.Yu [31] believe that the gas boilers used in the implementation of the "coal-to-gas" work can achieve good economic and social benefits. D.Shi and S.Li [32] point out that compared to traditional coal heating, gas may incur higher operational costs, but its construction and production costs are relatively lower. S.Li and M.Chen [33] demonstrates that "coal-to-gas" holds significant practical implications for low-carbon environmental protection and sustainable development but faces obstacles in product supply, heating conditions, and other aspects.

3. Analytical Framework

This article mainly focuses on the selection of a path for mobile governance. The analytical framework for this study is as follows: Tasks from higher-level authorities are transmitted to local governments, influencing the allocation of attention by local governments. To ensure the smooth implementation of policies, local governments trigger the mechanism of mobile governance. The selection path of mobile governance reflects the characteristics of path dependence, including three paths: conformist-based path dependence, policy-based path dependence, and demand-based path dependence. At the grassroots level, mobile governance pushes policy tasks downward layer by layer, ultimately achieving the goal of local government's credit claiming or blame avoidance. The schematic diagram is shown below (Figure 1):

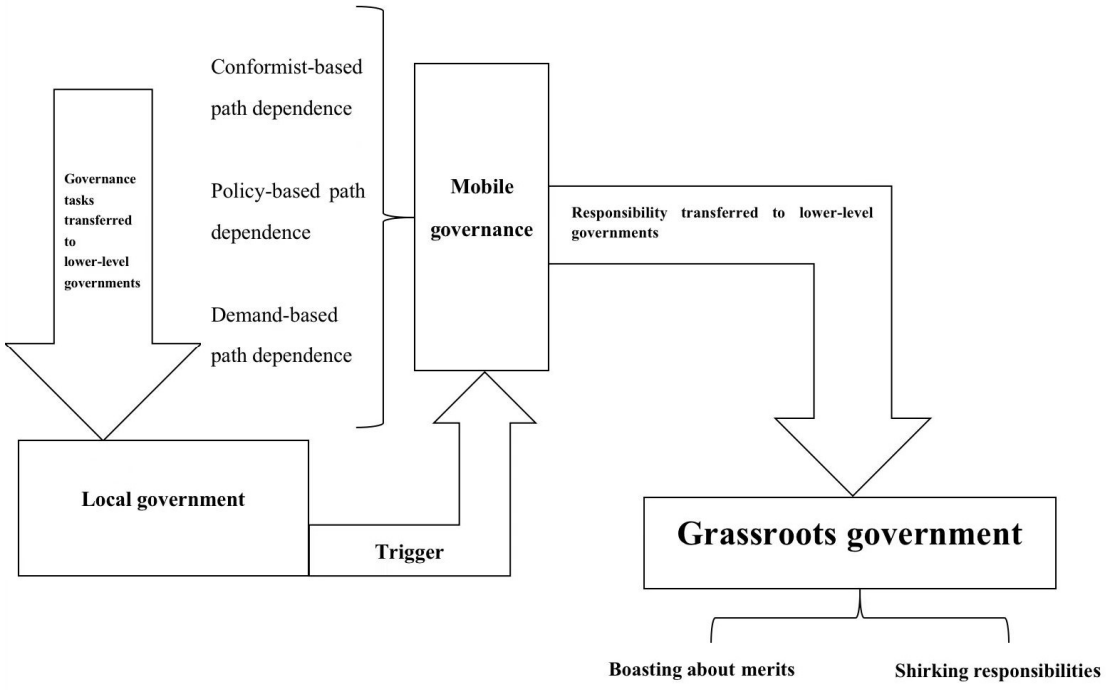

Figure 1. The path selection of mobile governance.

This article adopts a participatory observation and interview method to conduct in-depth investigations on implementing Handan's "coal-to-gas" policy. Handan possesses a certain degree of typicality, which contributes to observing experiences and extracting mechanisms regarding mobile governance. On the one hand, Handan faces complex and heavy governance pressures. In addition to fulfilling regular functions related to economic and social development, as a city rich in coal resources and with a relatively developed heavy industry, Handan also shoulders the heavy task of environmental protection. Therefore, Handan has implemented mobile governance multiple times in the field of environmental protection, demonstrating a certain path dependence on mobile governance. On the other hand, Handan faces tight public finances. In 2023, the general public budget revenue of Handan was 24.83 billion yuan, while the total expenditure, debt repayments, and other expenses reached as high as 30.46 billion yuan that year. The deficit

was only balanced after receiving transfers from higher-level governments and assistance from other areas within the province. Therefore, Handan lacks sufficient public finances for long-term conventional governance and needs to swiftly push relevant policy tasks and governance requirements to the grassroots level through short-term mobile governance.

The sources of information for this article were collected by the author through field research and telephone interviews conducted in Handan in August 2022 and July–August 2023. The author conducted a total of 11 interviews with key stakeholders, including the "Coal-to-Gas" Working Group of Handan, the Development and Reform Commission of Handan, the Heating Office of Handan, the Natural Gas Company of Handan, the "Coal-to-Gas" Working Group of F Mining Area in Handan, and relevant personnel from D Town in S County of Handan. Additionally, the author interviewed 14 residents from L Village and B Village in F Mining Area of Handan and C Village in D Town of S County, Handan. A total of 18 relevant documents, work reports, and 5 meeting records were also collected during the research process.

4. Case Study: Implementation of the "Coal-to-Gas" Policy in Rural Areas of Handan

This article takes the implementation of the "coal-to-gas" policy in rural areas of Handan as an example. It provides a brief overview of the policy background, policy promotion, policy measures and effectiveness, and existing issues regarding the "coal-to-gas" policy in rural areas of Handan.

4.1. The Policy Background of the "Coal-to-Gas" Initiative in Rural Areas of Handan

Handan is one of the major cities in the Beijing-Tianjin-Hebei region facing significant air pollution issues, which has greatly influenced environmental governance in the city. According to relevant statistics from the Chinese Ministry of Environmental Protection, the ambient air quality in Handan is relatively poor, ranking low among the over 70 cities monitored. The specific details can be seen in Table 1.

Table 1. Ranking of air quality monitoring in Handan.

Year	Ranking among 74 Cities	Main Pollutants
2013	74	PM2.5
2014	72	PM2.5
2015	71	PM2.5
2016	70	PM2.5
2017	71	PM2.5

Table 1 shows that from 2013 to 2017, the air pollution issue in Handan has been worsening, consistently ranking among the lowest in air quality among the over 70 cities monitored. The reason behind this situation lies in the lack of rationality in Handan's energy structure. Handan possesses abundant natural resources, with coal reserves accounting for approximately 30% of its resources, nearly 20% within the province. Leveraging this resource advantage, most of the large energy-consuming enterprises in Handan are primarily coal-based and predominantly belong to the secondary industry. Given the current domestic emphasis on energy conservation and emission reduction, Handan's current energy structure will likely contribute to further aggravation of environmental pollution.

Starting in 2013, China introduced numerous policies targeting air pollution control and energy conservation and emission reduction, gradually making energy conservation and emission reduction work a focal point of societal concern. Subsequently, China implemented the "Northern Region Winter Clean Heating Plan (2017–2020)" (hereinafter referred to as the "Plan"), and local governments formulated corresponding plans in accordance with the requirements outlined in the "Plan", gradually initiating the "coal-to-gas" initiative. Handan is located in the Beijing-Tianjin-Hebei region of northern China, with a relatively high level of industrialization and comparatively larger energy reserves compared to other regions. With the acceleration of economic development, the local atmospheric environmental pollution issue has become increasingly severe. Since 2016, Handan has organized multiple conferences specifically addressing air pollution control, energy conservation, and emission reduction, considering them the government's primary focus. In 2017, Handan invested nearly 4 billion yuan in environmental governance and subsequently launched the comprehensive "Gasification of Handan" project. In 2018, Handan signed a strategic cooperation framework agreement in the energy sector with partner enterprises, explicitly stating the goal of completing the "coal-to-gas" transformation for one million rural households by 2021. To achieve better energy conservation and emission reduction results and effectively protect the ecological environment, the Handan government formulated targeted "coal-to-gas" policies based on the local circumstances.

4.2. Policy Measures for the "Coal-to-Gas" in Rural Areas of Handan

Based on the current dual-carbon strategy goals proposed by President Xi Jinping and the relevant policies implemented by the country in energy conservation and emission reduction, Handan has formulated numerous related policies regarding the "coal-to-gas" initiative. The specific summary is as follows: In 2017, the city formulated the "Comprehensive Renovation Implementation Plan for Coal-fired Boilers in Handan" and the "Special Action Plan for Pollution Control of Loose Coal in Handan". In 2018, the city developed the "2018 Work Implementation Plan for Atmospheric Pollution Prevention and Control in Handan" and the "Action Plan for Tackling Air Pollution Control". In 2019, they introduced the "Ten Measures to Accelerate Energy Conservation and Environmental Protection Industry" and the "Three-Year Plan for Clean Energy Substitute for Coal in Handan". In 2020, the "Work Plan for Atmospheric Pollution Prevention and Control in Handan" was issued. In 2021, the "Emergency Plan for Key Polluted Weather in Handan" was formulated. The policy measures for the "coal-to-gas" initiative in rural areas of Handan can be summarized as follows while retaining the parentheses during translation: (1) Enhancing residents' participation through price subsidies to increase their enthusiasm; (2) Promoting the implementation of the "coal-to-gas" policy through special campaigns for the control of loose coal; (3) Improving supporting facilities for the transformation to gas heating; (4) Ensuring a stable natural gas supply to ensure a smooth winter for the people.

4.2.1. Enhancing Residents' Participation through Price Subsidies to Increase Their Enthusiasm

To ensure that residents can actively and willingly transition from traditional heating methods and further increase the utilization rate of clean heating, the government of Handan has provided numerous subsidies to residents during the heating season. The relevant details can be found in Table 2:

Table 2. Subsidies for "coal-to-gas" in Handan during heating period.

Subsidy Type	Subsidy Standards
Equipment procurement	According to the purchase investment of gas equipment by farmers, each household can receive a maximum subsidy of 2500 yuan.
Construction of household pipelines in the village	The corresponding subsidy standards will be determined by the county, with each household receiving a subsidy of 800 yuan from the province and city.
Gas subsidy	During the heating period, a gas consumption subsidy of 1.5 yuan per cubic meter will be provided for rural households, with a maximum subsidy of 900 cubic meters per household.

As indicated in Table 2, Handan provides gas subsidies to residents for various aspects of the "coal-to-gas" initiative. Whether it is the purchase of equipment, construction of pipelines, or gas consumption, certain subsidies are provided, thereby increasing residents "initiative to use gas, effectively reducing the cost of their gas consumption, and promoting the acceptance of the relevant "coal-to-gas" policies among an increasing number of residents".

4.2.2. Promoting the Implementation of the "Coal-to-Gas" Policy through Special Campaigns for the Control of Loose Coal

In the process of addressing air pollution, the control of loose coal is a key focus of Handan. The "Handan Air Pollution Control Plan (2019–2021)" clearly states that Handan should prioritize the control of rural areas to achieve widespread clean heating during winter and reduce the use of loose coal for combustion. Handan has developed numerous targeted measures for the control of loose coal, such as the "Comprehensive Air Pollution Control Work Plan (2019–2021)" and others, which specifically outline corresponding control measures for loose coal. According to the relevant data released by Handan, in 2017, the city implemented measures to control pollution from enterprises and reduce coal usage, comprehensively carrying out pollution control work and providing clean coal and clean equipment to over 10,000 rural households. In 2018, Handan closed nearly 300 outlets selling inferior-quality coal, conducting inspections throughout the entire city. In 2019, Handan further strengthened the control of loose coal, closing nearly 20 coal mines and eliminating over 2 million tons of coal. In 2020, Handan began establishing coal-free zones and sealing off all outlets selling inferior-quality loose coal for external distribution to effectively eliminate loose coal. In 2021, Handan intensified the control over the use and sale of loose coal in regions implementing the "coal-to-gas" policy while emphasizing the promotion of clean coal in areas without relevant policies.

4.2.3. Improving Supporting Facilities for the Transformation to Gas Heating

The rural housing has poor airtightness compared to the concentrated residential buildings in urban areas. During the heating process, there is more heat loss in rural areas, leading to poorer natural gas heating effectiveness in rural regions. This is one of the reasons why the implementation of the "coal-to-gas" policy faces difficulties in rural areas. To address this issue, the government of Handan encourages the use of new insulation materials in newly constructed houses by providing certain subsidies. They also promote the improvement of airtightness and insulation of existing houses through exterior wall insulation renovations in rural areas. Additionally, the government provides certain subsidies for the renovation of natural gas facilities for the "coal-to-gas" initiative in rural areas, which enhances the enthusiasm of the local population for the transition to natural gas.

4.2.4. Ensuring a Stable Natural Gas Supply to Ensure a Smooth Winter for the People

Another difficulty in the implementation of the "coal-to-gas" policy in rural areas is the unstable gas source in rural areas, which may lead to the situation that rural residents cannot spend the winter smoothly in extreme cases. As a result, the local residents have some resistance to the implementation of the "coal-to-gas" policy. Therefore, Handan has taken the following measures. On the one hand, it has adjusted the user structure to prioritize the gas supply for residents' heating, ensuring their normal living. On the other hand, during the non-heating period, it has built corresponding gas storage facilities and broadened the gas sources to ensure that residents can spend the winter smoothly and enhance their trust in the "coal-to-gas" policy.

4.3. Policy Implementation Deviation: Issues in the "Coal-to-Gas" Initiative in Rural Areas of Handan

In the process of implementing the "coal-to-gas" initiative in Handan, the municipal government of Handan serves as the primary policy implementing body. However, currently, it exhibits a lack of implementation capacity in carrying out the "coal-to-gas" work. The personnel in the relevant implementing institutions show a lack of enthusiasm and a lack of awareness regarding environmental air pollution control. They also fail to give due attention to their own work and are unable to fully leverage their roles in air pollution prevention and control. Some personnel involved in the "coal-to-gas" work mistakenly believe their work is considered complete as long as natural gas is connected to households. They lack an understanding of the comprehensive conditions of rural transformation users, leading to the inadequate implementation of the "coal-to-gas" initiative in rural areas.

In addition to the lack of implementation capacity by the municipal government of Handan, the economic conditions in Handan, especially in rural areas, pose significant obstacles to the "coal-to-gas" process. Residents in rural areas with better household conditions are more likely to accept the "coal-to-gas" initiative, while those with poorer economic conditions tend to resist it due to concerns about high transformation costs. Although the government provides subsidies, they are only provided after the completion of the "coal-to-gas" transformation. Furthermore, Handan is a traditional industrial city that heavily relies on the steel and coal industries for its economic development. Therefore, the implementation of the "coal-to-gas" initiative will directly impact the economic growth of Handan. This requires the local government to fully grasp the points of interest coordination between the "coal-to-gas" initiative and local economy to minimize the challenges associated with its implementation. Moreover, the "coal-to-gas" initiative will also cause losses to many local enterprises in Handan. Key targets of pollution control and high energy consumption, such as coal and steel companies, will strongly resist the "coal-to-gas" initiative.

In response to the existing deviations in the implementation of the "coal-to-gas" policy, Handan launched the "Beautiful Countryside, Gasification Project" strategy in 2022, mobilizing the entire city to carry out "coal-to-gas" transformations in 78 towns within its jurisdiction. Within the first two years of implementing the "Beautiful Countryside, Gasification Project" strategy, a total of 98,700 rural households in Handan underwent "coal-to-gas" transformations. Preliminary calculations indicate that over 40,000 tons of coal can be saved in winter 2022. The strategy of the "Beautiful Countryside, Gasification Project" in Handan adopts a "one-third" system, where the government subsidizes one-third of the cost of "coal-to-gas" transformation, the village collective contributes one-third of the cost, and individual households contribute one-third of the cost. This approach has partially reduced the personal expenses of villagers and alleviated some of the economic burdens associated with the "coal-to-gas" policy.

However, the rapid implementation of the "coal-to-gas" policy has also brought about certain issues. Natural gas prices are several times higher than the price of scattered coal commonly used in rural areas, and the heating effect may be less stable when the natural gas supply is inconsistent compared to burning scattered coal. Some households have had their stored scattered coal forcibly confiscated by the work teams responsible for the "coal-to-gas" initiative without

receiving relevant economic subsidies. The excessive emphasis on the speed of promoting the "coal-to-gas" policy has led to overlooking the quality of the transformation process. As a result, some "coal-to-gas" projects have failed to meet the required standards, leading to frequent malfunctions during winter heating. Moreover, there has been a failure to fully comprehend the spirit of the higher-level government's principle of "electricity if suitable, gas if suitable". In some areas where it is not suitable to implement the "coal-to-gas" policy, a blind implementation has caused policy mistakes.

The rapid advancement of the "coal-to-gas" strategy has accelerated the pace of rural "coal-to-gas" transformations in Handan to a certain extent and achieved some governance effectiveness. However, the "one-size-fits-all" approach of rapid governance has also brought about certain governance problems. The mobile governance of the rural "coal-to-gas" policy in Handan is not arbitrary but based on relevant path-dependent governance logic. The following section analyzes the logic of mobile governance from a path-dependent perspective.

5. Analysis of Logic of Mobile Governance from the Perspective of Path Dependency

From the perspective of path dependency, the logic of mobile governance can be analyzed in three aspects: conformist path dependency, policy path dependency, and demand path dependency.

5.1. The Logic of Mobile Governance under the Path Dependency of Conformist

Under the conformist path dependency, mobile governance in rural areas of Handan is mainly manifested in the "coal-to-gas" policy. In terms of Handan as a whole, using natural gas for heating is more effective and cost-efficient than using electricity for heating. Residents undergoing the "coal-to-gas" transformation incur lower expenses and obtain higher benefits compared to those undergoing the "coal-to-electricity" transformation. However, for certain rural areas in Handan, particularly in the southern mountainous regions where the construction of natural gas stations is challenging, and heat sources are unstable, the more suitable policy is the "coal-to-electricity" transformation for heating facilities electrification. Due to customary path dependency, despite the appropriateness of the "coal-to-electricity" policy for these areas, the rural regions located in mountainous areas followed the trend of "coal-to-gas" transformations adopted in most rural areas throughout the city, resulting in suboptimal outcomes.

The underperformance of Handan's "coal-to-gas" project can be analyzed following the logic presented below. Under the policy pressure from higher authorities, lower-level departments to achieve centralized and unified policy requirements, resorted to using mobile governance to implement relevant policies. Faced with the dual pressures of time and performance, grassroots cadres lacked sufficient time, energy, and resources to consider tailored solutions based on local conditions. Therefore, from the perspective of rational choice by grassroots cadres, adopting commonly used approaches from other regions to promote policy implementation was the most cautious approach. Even if there were implementation deviations, they could avoid responsibility due to the principle that "the law does not hold individuals accountable". This underscores the policy selection root of conformist path dependency. Conformist path dependency ensures that the policy execution by grassroots cadres follows the mainstream trend. Driven by a mentality of "not seeking merit but avoiding blame", they may disregard the requirement for practicality and tailored solutions, leading to policy implementation deviations, exacerbating implementation challenges, and causing the public to be more perplexed and unaccepting of the policy's effectiveness, thus failing to realize the practicality of the policy in practice.

5.2. The Logic of Mobile Governance under the Path Dependency of Policy

The policy path dependency in the "coal-to-gas" policy in rural areas of Handan is mainly evident in grassroots governments' compulsory collection of scattered coal stored in residents' homes without providing relevant financial compensation, leading to resident dissatisfaction.

The collection of scattered coal stored in residents' homes by grassroots governments is not unfounded or unsupported. In the "Handan Coal-to-Gas Policy Regulations" issued in 2022, it is stipulated that "to advance the effective implementation of the coal-to-gas strategy, residents' stored coal should be acquired on a principle of equivalence and subsidies discounted for the transformation of natural gas heating equipment in residents' homes". However, there are certain policy loopholes regarding the issue of price subsidies after the collection of coal stored in residents' homes. Due to Handan's overall adoption of a "three-three system" for the coal-to-gas strategy, where the government subsidizes one-third of the cost, the village collective expends one-third, and farmers contribute one-third, the discounted subsidies after the collection of stored coal are often conflated with government subsidies. Some farmers have a large amount of stored coal, and the calculated amount may exceed the government's coal-to-gas subsidy by

more than double. However, due to existing policy loopholes, it is challenging for the public to receive discounted subsidies for the collected coal.

The escalation of the issue originated from the scattered coal collection work in L Village, F Mining Area of Handan. The mining area in Handan is rich in coal resources, with low-priced scattered coal stored by each household. With the gradual implementation of the coal-to-gas policy, the F Mining Area government accelerated the collection of scattered coal. However, due to certain policy loopholes in the coal collection regulations, the related discounted subsidies for scattered coal were consistently incomplete, eventually turning into forced collection, leading to several instances of forcibly confiscating residents' scattered coal storage and even violent coal collection. The violent collection of scattered coal sparked strong discontent among the populace. Coupled with the fact that the heating effects in the first winter of the coal-to-gas policy did not meet expectations, far below the previous coal-burning heating efficiency, the residents became increasingly dissatisfied with the "Coal-to-Gas" policy, significantly impeding the advancement of related coal-to-gas policies.

The strong discontent among the population triggered by the scattered coal collection in L Village can be analyzed using the following logic. In cases where there are certain policy loopholes in higher-level policy regulations, actions such as collecting scattered coal, which offers some profitability, may be exploited by unscrupulous leadership for personal gain. By utilizing policy-induced path dependency and using the existing policy loopholes in higher-level regulations as a cover, corrupt officials have been able to profit from the difference in coal collections. Some individuals involved in the downfall of the F Mining Area leadership in 2023 confirmed the embezzlement of funds related to the conversion of scattered coal. The sustainability of policy-induced path dependency arises from the pressure on higher-level governments to swiftly implement policies, allowing minor non-compliant actions by grassroots governments to be masked under the guise of policy implementation, becoming an excuse for local governments to address compliance inspections by higher-level authorities. However, the accumulation of such non-compliant actions has further exacerbated conflicts and significantly hindered the effective implementation of policies at the grassroots level.

5.3. The Logic of Mobile Governance under the Path Dependency of Demand

Behind demand-driven path dependency, there are mainly two logical chains: seeking credit and avoiding responsibility. These correspond to different political attitudes. When the "coal-to-gas" policy belongs to the "direct competition" category of mobile tasks or the "championship" category of competitive tasks, the speed of progress in the "coal-to-gas" project can serve as a way for local officials to seek credit from higher-level departments. However, when higher-level departments vigorously promote the "coal-to-gas" project due to environmental pressure, the "coal-to-gas" project shifts from being a mobile or competitive task to a daily or restrictive task. The change in the "coal-to-gas" project's "political positioning" determines which logical chain local governments choose. In comparison, the seeking credit logical chain emphasizes achieving outstanding results, which is the root cause of many showcase projects. The avoiding responsibility logical chain focuses on promoting the policy comprehensively and with no loopholes, thus forming the root of movement-based grassroots governance logic. The avoiding responsibility logical chain, due to its more thorough policy execution, may trigger more contradictions between public opinion and policy execution. Both the seeking credit and avoiding responsibility logical chains reflect the psychological aspect of demand-driven path dependency. Regardless of whether they are seeking credit or avoiding responsibility, they both reflect the need for grassroots officials to achieve political performance and retain their positions. The political mindset of seeking credit and avoiding responsibility in public policy execution reflects the dependency on demand-driven paths.

The logical chain of mobile governance under the lens of path dependency can be summarized through the following process: pressure from superior tasks → allocation of attention by lower-level governments → path dependency transmitting the pressure of superior tasks to the grassroots → mobile governance of grassroots governments pushing relevant tasks downward step by step → completion of the goals of seeking credit or avoiding responsibility for lower-level governments. The factors that lead to the generation of mobile governance under the perspective of path dependency are primarily due to the problem of income distribution and governance power mismatch in grassroots governance in China.

The current income distribution models in China, whether "inverted T-shaped", "pyramid-shaped", or "inverted gourd-shaped", exhibit a scenario where the number of middle-low-income earners is higher compared to middle-high-income earners. The governance structure in China is characterized by a "thick middle, sharp top and bottom". This creates a structural mismatch, with more individuals in the middle-low-income group having weaker governance power while fewer individuals in the middle-high-income group have more concentrated governance power. This uneven

distribution of governance power is also present across regions and industries. This structural mismatch leads to challenges in policy execution, such as "high-level urgency, grassroots fatigue, middle-level resentment". When high-level authorities identify deviations in policy execution, policy distortions, formalism, and bureaucratism, they naturally feel the urge to enforce the policy. However, due to the pressure and burden caused by the vertically structured tasks and responsibilities, grassroots officials face challenges in executing the policies properly. Middle-level officials may feel resentful, even if they believe they have made every effort. They may criticize the policy for being overly rational, believing that mobile governance is insufficient to solve the problems. As a result, they may blame subordinates for inadequate execution or improper personnel selection. Some may have the intent but lack the capability to act due to personal limitations, while others might have the ability but lack the intention when personal interests override public interests. Sometimes, when influential governing officials depart, there may be a new round of demolition and reconstruction. Therefore, the issues at the middle level are influenced by various factors, including incomplete governance resources and capabilities; inadequate policy implementation; poor communication; lack of warmth in policy execution; a rigid hierarchical system unable to adapt to the socioeconomic conditions of modern society; a need to improve existing incentive and promotion mechanisms such as the "championship system;" a requirement for further improvements in the rule of law; a relatively limited range of grassroots information sources; traditional 'official-centric' and 'self-serving' ideologies; and the personal conduct of governing officials. Policy formulation and execution should be based on a view of human nature, as individuals are inherently prone to selfish motivations in any system. The focus of issues under the perspective of path dependency in mobile governance is not on the efficiency of transmitting administrative commands but rather on how effectively the state and society can interact to achieve public satisfaction and social welfare. Moreover, the incompleteness of structural reasons, such as administrative system constraints and imbalanced incentives, often leads to ineffective governance. due to mismatches between administration and society or misunderstandings between administration and social forces. The struggle to reconcile these interactive processes often results in a crisis of mutual trust. Traditional research tends to focus on structural reasons such as administrative system constraints and incentive imbalances, for example, structural contradictions in the "blocks". The "coincidence of responsibilities" between the superior and lower-level governments arising from the alignment of responsibilities from the top-down configuration causes the system to have challenges in achieving societal governance. Key focus areas at this level are issues such as linear resource dependency, management control distortions, and imbalances in incentive structures. Linear resource dependency primarily involves the pressure exerted from the top-down within the system, serving as an important channel for achieving internal performance within the system. Under a pressure-driven system, local governments at the bottom are directly targeted. They are loaded with many public affairs stemming from administrative extensions. The top-down demands and the functional settings often lead to a unidirectional approach, with upper-level governments unilaterally directing work without achieving genuine social governance. Management control distortions mainly refer to the inevitability of deviations in public policy execution. The consequences of these deviations manifest in the replacement of policy goals or practical work adaptations based on the needs of local governments regarding their rights and interests. This results in management control distortions where local government bodies bypass the intended policy goals or impose strict requirements through a 'one-size-fits-all' or misinterpretation approach. The imbalance in incentive structures primarily stems from multiple reforms in the administrative system addressing the "last mile" problem caused by the fragmentation of tasks among different administrative units. Consequently, a series of measures, such as territorial management and accountability, have been introduced. Project management, listing, leadership groups, and mobile governance play vital roles in this issue. Over time, grassroots governance has formed two very distinct governance approaches: "baseline thinking' and "attention allocation thinking". Baseline thinking is closely related to the negative list of accountability items, focusing on preventing significant disasters in the jurisdiction. The core essence of this approach is stability, where governance methods aim for simplified approaches to accident prevention. Attention allocation thinking, on the other hand, is influenced by the level of focus from senior leadership on specific matters, which determines the resources and efforts allocated by lower-level governments. In practice, when senior leadership directs a task, grassroots workers tend to prioritize that task over others temporarily.

When middle-level officials focus more on how to address inspections and performance evaluations from superior organization, they tend to overlook the importance of catering to the needs of grassroots residents. This can harm the interests of some grassroots residents in fulfilling tasks delegated from higher levels. The resulting issues are perhaps the most dissatisfactory aspect for grassroots residents in the domain of state governance, touching upon the most painful points concerning their interests and representing a significant factor in why the public perceives society as unjust. Measures such as territorial management and accountability were originally intended to assess the extent of

policy implementation at the middle level. However, loosening supervision can lead to operational challenges in policy execution, while heightened supervision may result in a cascading effect of increased demands. A situation where poor outcomes outweigh the benefits. The problematic cycle of "one intervention leads to failure, failure leads to retraction, retraction leads to chaos, chaos leads to suppress", ultimately results in the detriment of public interests. The emergence of the "supervisory paradox" here highlights that neither extreme—under supervision or over-supervision—is effective. Many of the challenges stem from the darker side of human nature. Therefore, policy formulation and execution should account for this aspect of human nature. Most people exhibit a blend of "social beings" and "economic beings", with individuals reflecting their social side when regulations and constraints are present. When supervision lags behind and human nature's "evil" side emerges, individuals may act as "rational economic beings", prioritizing personal interests over communal and societal well-being. This aspect of human nature is subjective and cannot be altered externally, irrespective of the system, institution, or model in place. However, apart from these subjective factors, there is a potential to enhance policy execution through an objective approach and explore a new form of supervision that considers the perspective of those affected by policies. This approach will allow policymakers and implementers to relate more to those impacted by policies, reducing the prevalence of issues stemming from various forms of governance dependency, such as conformist, policy-induced, and demand-driven governance under mobile governance occurrences in the path dependency perspective.

6. Discussion and Conclusions

This article explores the current status of mobile governance from the path dependency perspective by analyzing grassroots governance issues that arose in the coal-to-gas project in rural areas of Handan. The study found that under the lens of path dependency, mobile governance primarily consists of two logical chains-seeking credit and avoiding responsibility. The seeking credit chain corresponds to mobile tasks being like a "direct competition" or a "championship" competitive task, while the avoiding responsibility chain corresponds to daily tasks resembling a "qualifying match" or restrictive tasks akin to an "elimination match". Behind the seeking credit and avoiding responsibility chains correspond to three types of grassroots governance psychology-conformist path dependency, policy-induced path dependency, and demand-driven path dependency.

Addressing some political tasks that require rapid execution and inherent governance problems at the grassroots level, conventional administrative governance may not promptly achieve governance effectiveness or resolve long-standing issues. These prolonged issues can pose greater harm to national governance over time. Therefore, embedding mobile devices into routine systems under the legal framework is worth considering in order to address highly detested societal problems [34]. Departmentalism, tunnel vision, and local protectionism can create governance obstacles. Cross-regional law enforcement can effectively tackle issues in a short timeframe and enhance social equity in suitable areas where mobile governance can be applied. As reforms enter a stage of deep-seated interest adjustments and power restructuring, resistance tends to increase, sometimes necessitating the courage for drastic measures. For instance, recent campaigns like the anti-crime campaign and the establishment of the Central Leading Group for Overall Reform Coordination exemplify embedding mobile into routine practices. However, it is essential to consider who will balance the misuse of power once power B sanctions power A. The potential unchecked expansion of law enforcement officers' discretionary powers, if the legal framework supporting mobile governance remains incomplete, can distort governance and hinder the establishment of social equity, escalating social conflicts.

Ultimately, many grassroots mobile governance phenomena in China stem from non-institutionalized and ambiguous interactions. To further regulate these practices, efforts can focus on three key areas:

Firstly, the formulation of comprehensive grassroots governance responsibility lists should be accelerated to clarify the functions of grassroots governments through a rights-clarifying approach [35]. Clearly defining the relations of rights and responsibilities in grassroots governance is essential to enhance governance efficiency. The emphasis on delineating responsibilities and powers in grassroots governance revolves around creating comprehensive responsibility lists. Implementing and improving the responsibility listing system can provide a scientific basis to demarcate boundaries between government, market, and society, promoting government function transformation and modernizing governance.

Secondly, provincial governments should enact regulations to standardize the grassroots governance process. In response to governance issues at the grassroots level, provincial governments can establish related regulations to specify governance authority and enhance monitoring over the entire chain of grassroots mobile governance, thereby boosting governance efficiency. Provincial and grassroots governments can try implementing a "responsibility sequence" approach to organize government responsibilities into hierarchical layers and clarify the core, differentiated, and

transitional responsibilities that each level of government encompasses. This involves distinguishing between continuous and hierarchical responsibilities to streamline governance mechanisms at the grassroots level.

Thirdly, promoting the development of e-governance and digital government technologies to elevate the legal compliance and standardization of grassroots governance, reducing the prevalence of mobile governance. The utilization of e-governance and digital government technologies can partially replace the traditional top-down governance transmission model with a platform-based parallel governance transmission model, potentially reducing conformist, policy-induced, and demand-driven path dependencies to mitigate the existence of mobile governance at the grassroots level and enhance the legal compliance and effectiveness of governance.

These measures, to a certain extent, can alleviate the issues of path dependency and political operational non-compliance in grassroots mobile governance. However, the governance strategies proposed in this article have yet to be empirically validated and lack practical experience. Given the limited firsthand experience in grassroots governance, the article's content remains somewhat theoretical and lacks details on practical implementation. Therefore, while the analysis and proposed reform paths may seem idealistic, they may lack practicality. Future research should aim to deepen the study based on expanding practical experiences.

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References

1. Hao S, Li M. Why is sporty governance "useful but not useless"—On sporty governance as a governance tool. *Explor. Contention* **2022**, *10*, 165–176+180.
2. Feng S. The Formation and Variation of China's National Movement: A Holistic Explanation Based on Political System. *Open Times* **2011**, *1*, 73–97.
3. Liu NN, Lo CW-H, Zhan X, Wang W. Campaign-Style Enforcement and Regulatory Compliance. *Public Adm. Rev.* **2014**, *75*, 85–95.
4. Whyte MK. Bureaucracy and modernization in China: The Maoist critique. American Sociological Review. *Am. Sociol. Rev.* **1973**, *38*, 149–163.
5. Zhou X. Sports governance mechanism: rethinking the institutional logic of China's national governance. *Open Era.* **2012**, *9* 105–125.
6. Yang G. *Introduction to Politics*; Renmin University of China Press: Beijing, China, 2000.

7. North DC. *Institutions, Institutional Change and Economic Performance*; Cambridge University Press: Cambridge, UK, 1990.
8. David PA. Why are institutions the 'carriers of history'?: Path dependence and the evolution of conventions, organizations and institutions. *Struct. Chang. Econ. Dyn.* **1994**, *5*, 205–220.
9. Richard D. What makes German banks different. *Small Bus. Econ.* **1998**, *10*, 93–101.
10. Paul P. Increasing returns, path dependence, and the study of politics. *Am. Political Sci. Rev.* **2000**, *94*, 251–267.
11. Gerd S. From path dependency to path creation: Finland on its way to the knowledge-based economy. *Curr. Sociol.* **2007**, *55*, 92–109.
12. Raghu G, Arun K, Peter K. Path dependence or path creation? *J. Manag. Stud.* **2010**, *47*, 760–774.
13. Liu Y. On the Framework of Path Dependency Analysis. *Teach. Res.* **1999**, *1*, 42–47+80.
14. Deng D. The Types and Transformation Laws of Institutional Changes. *J. Ningxia Univ. (Humanit. Soc. Sci. Ed.)* **2001**, *5*, 71–75+89–127.
15. Tang J, Nian H. Changes in corporate governance structure, path dependence, and institutional innovation in state-owned enterprises. *Jianghan Trib.* **2013**, *2*, 71–74.
16. Li X, Hao Q. The Path Dependence and Cracking Path of Ecological Civilization System Construction. *Ecol. Econ.* **2015**, *31*, 166–169.
17. Duan Y, Hou R. Research on Path Dependence as a Mode of Institutional Change. *Econ. Probl.* **2016**, *2*, 24–31.
18. Peters BG. *Institutional Theory in Political Science: The New Institutionalism*; Edward Elgar Publishing: Cheltenham, UK, 1999.
19. Wahyu PW, Yuswan M, Wienda PY, Djoni H, Harimanto S, Rezk A. Status and outlook of natural gas industry development in Indonesia. *J. Nat. Gas Sci. Eng.* **2016**, *29*, 55–65.
20. David B. Designing innovative clean energy programs: Transforming organizational strategies for a low-carbon transition. *Energy Res. Soc. Sci.* **2020**, *67*, 101545.
21. Ladage S, Blumenberg M, Franke D, Bahr A, Lutz R, Schmidt S. On the climate benefit of a coal-to-gas shift in Germany's electric power sector. *Sci. Rep.* **2021**, *11*, 11453.
22. Yusoff NYBM, Bekhet HA, Mahrwarz S. Dynamic relationships between energy use, income, and environmental degradation in Afghanistan. *Int. J. Energy Econ. Policy* **2020**, *10*, 51–61.
23. Khan SAR, Zhang Y, Kumar A, Zavadskas E, Streimikiene D. Measuring the impact of renewable energy, public health expenditure, logistics, and environmental performance on sustainable economic growth. *Sustain. Dev.* **2020**, *28*, 833–843.
24. McKitrick R. Global energy subsidies: An analytical taxonomy. *Energy Policy* **2017**, *101*, 379–385.
25. Chen Z, Tan Y, Xu J. Economic and environmental impacts of the coal-to-gas policy on households: Evidence from China. *J. Clean. Prod.* **2022**, *341*, 130608.
26. Liu H. The "coal to gas" project is being carried out with caution—based on research and analysis of the "coal to gas" project in Beijing. *Macroecon. Res.* **2015**, *4*, 9–13.
27. Du X, Zhang Y, Yu Y. Comparative analysis of the environmental benefits of the life cycle of "coal to gas" and "coal to electricity" in rural areas of Beijing. *Urban Gas* **2017**, *12*, 31–34.
28. Li H, Zhang R, Xu J. Challenges and Countermeasures for China's "Coal to Gas Conversion". *Int. Pet. Econ.* **2021**, *29*, 35–41.
29. Wang S. The right and wrong of "coal to gas conversion". *Ecol. Econ.* **2018**, *34*, 10–13.
30. Xiong Y, Liao W, Wang L. Research on the Air Pollution Control Effect of the "Coal to Gas, Electricity" Policy. *Financ. Econ. Essays* **2021**, *3*, 103–112.
31. Han J, Yu J, Niu C. Research on the Impact of Coal to Gas Conversion on Air Pollutant Emissions for Residents in Hebei Province. *J. Saf. Environ.* **2018**, *18*, 1977–1981.
32. Shi D, Li S. Research on the Effect of Green Collaborative Development in the Beijing Tianjin Hebei Region: A Quasi Natural Experiment Based on the Implementation of the "Coal to Gas, Electricity" Policy. *Econ. Manag. Res.* **2018**, *39*, 64–77.
33. Li S, Chen M. Research on the Impact of the Policies of "Coal to Gas" and "Coal to Electricity" on Green Development. *Res. Financ. Issues* **2019**, *7*, 49–56.
34. Bai T, Xu D, Yang Q, Dudás Piroska V, Dénes Dávid L, Zhu K. Paths to low-carbon development in China: The role of government environmental target constraints. *Oeconomia Copernic.* **2023**, *14*, 1139–1173.
35. Yu C, Kang J, Teng J, Long H, Fu Y. Does coal-to-gas policy reduce air pollution? Evidence from a quasi-natural experiment in China. *Sci. Total Environ.* **2021**, *773*, 144645.