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ENVIRONMENTAL TAX REFORM AND GREEN TRANSFORMATION OF SMES IN A RESOURCE-BASED CITY: POLICY CONSTRAINTS AND BREAKTHROUGH PATHWAYS FROM ANYANG, CHINA

Chen Jie[1]
Zuriadah Ismail[2*]
Rusliza Yahaya[3]

[1] Fakulti Pengurusan dan Ekonomi, Universiti Pendidikan Sultan Idris
Email: p20251003607@siswa.upsi.edu.my
[2] Fakulti Pengurusan dan Ekonomi, Universiti Pendidikan Sultan Idris
Email: 15617708656@163.com
[3] Fakulti Pengurusan dan Ekonomi, Universiti Pendidikan Sultan Idris
Email: rusliza@fpe.upsi.edu.my
Corresponding Author

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Abstract: *This study examines how environmental tax reform shapes the green transformation of small and medium-sized enterprises (SMEs) in Anyang, China, a resource-based industrial city. Based on field visits to 62 SMEs, 128 interviews and 247 valid questionnaire responses, the study analyses the policy effects, implementation constraints and transformation outcomes of environmental taxation. A multidimensional evaluation framework is used to assess economic, environmental and social performance. The findings show that environmental tax reform promotes SME green transformation through three mechanisms: cost constraint, policy incentives and market competition. However, transformation performance remains uneven. Environmental outcomes are relatively strong, with an average score of 72.3, while economic outcomes remain weak, with an average score of 45.8. Only 10.1% of sampled firms reached an excellent transformation level. The main constraints include limited policy accessibility, weak interdepartmental coordination, insufficient finance and technology support, and low internal management capacity. The study contributes to policy practice by proposing coordinated measures involving differentiated tax policy, green finance, technology services and enterprise capability building.*

Keywords: *Environmental tax reform; SME green transformation; Resource-based city; Policy constraints; Anyang; Sustainable industrial development*

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Introduction

Environmental taxation has become an important policy instrument for correcting environmental externalities and promoting cleaner production. In China, the Environmental Protection Tax Law came into effect in 2018, marking a shift from administrative fee collection to a more rule-based tax instrument. The basic principle of the policy is that firms should pay more when they emit more pollutants, pay less when they emit less, and pay nothing when they do not emit taxable pollutants. This design is intended to internalise environmental costs and encourage enterprises to reduce pollution through technological upgrading, cleaner production and improved environmental management.

The policy challenge is especially important for resource-based industrial cities. Anyang, located in Henan Province, has long relied on steel, chemical, building-material and related manufacturing industries. SMEs account for a large proportion of local enterprises and employment, but many of them face outdated production processes, weak environmental management, limited financing capacity and relatively high pollution intensity. As environmental tax enforcement becomes stronger, these SMEs face both transformation pressure and policy opportunities.

Local data indicate that Anyang has gradually strengthened environmental tax implementation and green industrial governance. By 2024, the city had developed several national green factories and provincial smart factories, but green transformation achievements remained concentrated among larger firms. Many SMEs were still responding passively to environmental regulation rather than strategically pursuing green development. This creates an important policy question: how can environmental tax reform promote green transformation without imposing excessive survival pressure on SMEs?

Despite a substantial literature on environmental regulation, innovation and firm performance, three gaps remain. First, much of the evidence is drawn from national panels, large firms or heavily regulated sectors, leaving the implementation experience of SMEs in resource-based cities comparatively underexplored. Second, prior findings are mixed: some studies associate well-designed regulation with innovation and productivity gains, whereas others emphasise heterogeneous compliance costs and capability constraints. Third, existing work often examines environmental outcomes or competitiveness separately, with less attention to how tax pressure, supporting incentives and market transmission jointly shape economic, environmental and social transformation outcomes at the local implementation level. Anyang therefore provides a useful policy setting for examining why the same environmental tax framework can generate uneven transformation outcomes across SMEs (Porter & van der Linde, 1995; Berman & Bui, 2001; Lanoie et al., 2011; Dechezlepretre & Sato, 2017).

This study therefore investigates the policy constraints and breakthrough pathways of SME green transformation under environmental tax reform in Anyang. The study addresses three research questions: first, how has environmental tax reform been implemented in Anyang and how has it affected SMEs? Second, what are the major transformation outcomes and bottlenecks among SMEs? Third, what policy and managerial measures can improve the effectiveness of environmental tax reform while supporting SME sustainability?
The study contributes to research impact and policy practice in three ways. First, it provides local empirical evidence from a resource-based industrial city, a setting that remains

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underrepresented in environmental tax and SME transformation studies. Second, it integrates policy implementation, enterprise response and transformation performance within one analytical framework. Third, it proposes practical recommendations for differentiated environmental tax policy, interdepartmental coordination, green finance, technology support and social participation.

Literature Review and Conceptual Background

Environmental Taxation and Green Transformation

The theoretical foundation of environmental taxation is rooted in the idea of internalising negative externalities. When pollution costs are not reflected in production decisions, firms may overuse environmental resources and underinvest in cleaner technology (Pigou, 1920). Environmental taxes can correct this distortion by transforming external environmental damage into internal production costs. In this sense, environmental taxation is not only a revenue instrument but also a behavioural governance tool that encourages firms to adjust production decisions, improve pollution control and adopt cleaner technologies (OECD, 2010).

The literature therefore does not imply a uniform 'win-win' effect. Supportive evidence for the Porter hypothesis suggests that regulatory pressure can induce innovation and improve performance when firms possess the resources and incentives to respond (Porter & van der Linde, 1995; Ambec et al., 2013; Lanoie et al., 2011). In contrast, evidence on regulatory heterogeneity indicates that adjustment costs, technology vintage, financing constraints and managerial capability can weaken or delay economic returns, particularly for smaller firms (Berman & Bui, 2001; Gray & Shadbegian, 2003; Zhang et al., 2008). These divergent findings imply that local implementation conditions and complementary support mechanisms are central to explaining SME outcomes. This study addresses that issue by examining not only whether transformation occurs, but also why environmental benefits may improve faster than economic performance in a resource-based city context.

Existing studies show that environmental regulation may produce both compliance pressure and innovation incentives. The Porter hypothesis suggests that well-designed environmental policies can stimulate innovation and improve competitiveness, although the effect depends on policy design, firm capability and market conditions (Porter & van der Linde, 1995; Ambec et al., 2013). Empirical studies further indicate that environmental regulation can influence technological innovation, productivity and environmental performance, but the effects are not always uniform across firms and industries (Jaffe & Palmer, 1997; Berman & Bui, 2001; Dechezlepretre & Sato, 2017). For SMEs, the innovation effect of environmental regulation may be constrained by limited finance, weaker managerial capacity and insufficient access to environmental technology and professional compliance services (Zhang et al., 2008; World Bank, 2012).

SMEs in Resource-Based Cities

SMEs in resource-based cities occupy a structurally vulnerable position. They are often embedded in heavy industrial supply chains and face increasing environmental requirements from government regulators, leading enterprises and green supply chains. At the same time, they have limited access to capital, environmental technology and professional compliance services. These conditions make environmental tax reform a double-sided policy instrument: it

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can push SMEs toward cleaner production, but it can also increase operating costs if policy support is insufficient (OECD, 2010; World Bank, 2012).

In this study, SME green transformation is understood as a process through which firms reduce pollution, improve resource efficiency, adopt cleaner technology, strengthen environmental management and build market competitiveness through greener products or services. This understanding is consistent with eco-innovation research, which emphasises that green transformation involves not only pollution reduction but also technological, organisational and market-oriented change (Rennings, 2000; Johnstone et al., 2010). Therefore, the transformation outcome is evaluated through economic, environmental and social dimensions rather than pollution reduction alone. The relationships among these mechanisms and the resulting economic, environmental and social outcomes are summarised in Figure 1.

Analytical Mechanism

Based on the policy design of environmental tax reform and the field evidence from Anyang, this study conceptualises three mechanisms. The first is the cost-constraint mechanism: higher emissions increase tax burden and encourage firms to reduce pollutants, reflecting the externality-correction function of environmental taxation (Pigou, 1920; OECD, 2010). The second is the policy-incentive mechanism: tax reductions, subsidies and green credit can improve the return on environmental investment and encourage cleaner technology adoption (Porter & van der Linde, 1995; Ambec et al., 2013). The third is the market-competition mechanism: greener firms may obtain supplier recognition, brand value and market opportunities while avoiding penalties and production suspension. This mechanism is consistent with studies showing that environmental regulation may influence competitiveness through innovation, reputation and market adjustment (Dechezlepretre & Sato, 2017; Porter & van der Linde, 1995).

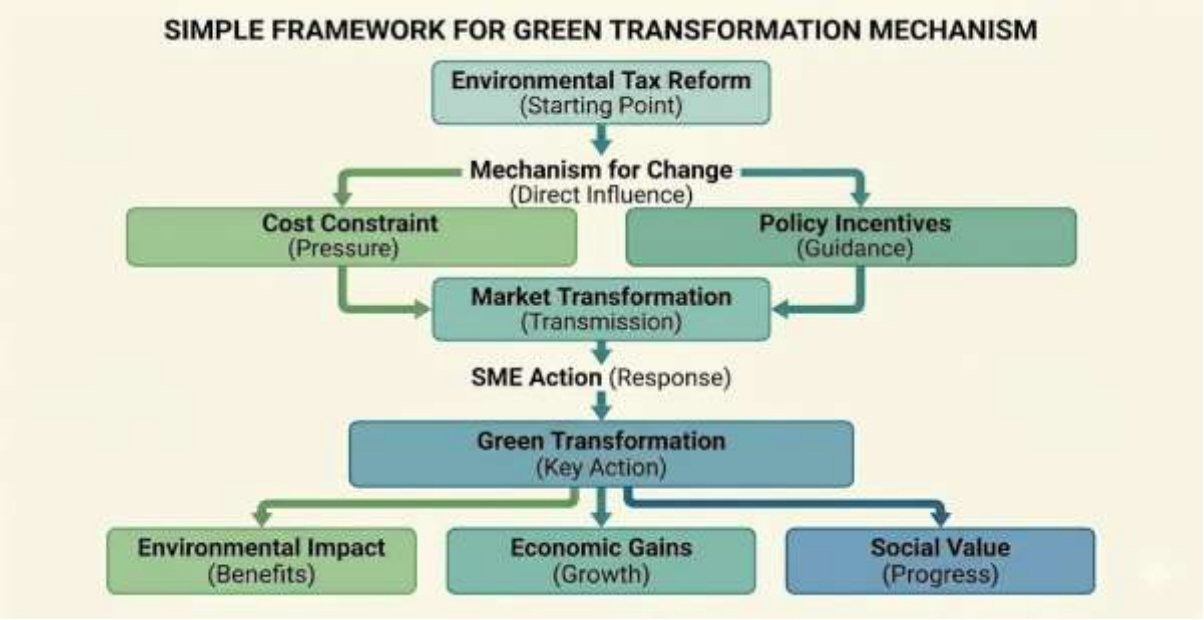

Figure 1: Analytical Mechanism of Environmental Tax Reform and SME Green Transformation

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Methodology

The questionnaire was structured around the study's research questions and covered policy awareness, transformation willingness, environmental investment patterns, perceived constraints and reported transformation outcomes. The survey indicators were used primarily for descriptive policy analysis and for constructing the multidimensional transformation evaluation, rather than for estimating latent psychological constructs. To strengthen interpretive validity, survey evidence was triangulated with interview accounts and field observations. Future multi-city studies could further strengthen the instrument by reporting formal scale reliability and construct-validity tests where multi-item latent measures are introduced.

This study adopts a policy-oriented mixed-method case study design. A mixed-method design is appropriate because the study combines quantitative survey evidence with qualitative field observations and interviews to obtain a more comprehensive understanding of policy implementation and enterprise responses (Creswell & Plano Clark, 2018). A single-city case study is also suitable because the research examines how a national environmental tax policy operates within a specific resource-based industrial context. Case study research is particularly useful when the research focuses on a contemporary policy phenomenon within its real-life setting (Yin, 2018). Anyang was selected because it has a strong traditional industrial base, a large number of SMEs, and substantial pressure for pollution reduction and green industrial upgrading.

The field investigation was conducted from June to July 2025 in Yindu District, Longan District and Tangyin County. These areas represent major local industrial clusters, including steel-related production, chemicals, food processing and building materials. The research team conducted field visits to 62 SMEs and completed 128 interviews with enterprise managers, environmental officials and tax personnel. A structured questionnaire was also distributed to SMEs. A total of 300 questionnaires were issued and 247 valid responses were retained, with an effective response rate of 82.3%. The combination of field visits, interviews and questionnaire data helped improve the depth and triangulation of the empirical evidence (Creswell & Plano Clark, 2018; Yin, 2018).

The study used multiple analytical techniques. Descriptive statistics were used to summarise policy awareness, transformation willingness, environmental investment and perceived constraints. The analytic hierarchy process (AHP) was used to construct a green transformation evaluation framework based on expert scoring from 15 experts, including government officials, enterprise managers and university scholars. AHP is suitable for assigning weights to multidimensional evaluation indicators because it allows complex decision problems to be structured into hierarchical criteria and compared systematically (Saaty, 1980). An input-output-oriented data envelopment analysis (DEA) assessment was then used to compare input-output transformation efficiency, using environmental investment and R&D investment as input indicators and pollution reduction, energy efficiency and profitability as output indicators. DEA is commonly used to evaluate relative efficiency when multiple inputs and outputs are involved (Charnes et al., 1978; Banker et al., 1984). Finally, case analysis was used to interpret transformation pathways in three representative SMEs and to provide contextual explanations for the quantitative findings (Yin, 2018). Table 1 summarises the research design, sample coverage and analytical methods.

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Table 1: Research Design and Data Sources

Component	Description
Research site	Anyang, Henan Province, China; a resource-based industrial city with steel, chemical, building-material and manufacturing SMEs.
Field visits	62 SMEs in Yindu District, Longan District and Tangyin County.
Interviews	128 interviews with enterprise managers, environmental officials and tax personnel.
Questionnaire survey	300 questionnaires distributed; 247 valid responses; effective response rate of 82.3%.
Sample profile	Steel 32%, chemical 25%, building materials 21% and other industries 22%; 68% of firms reported annual revenue between RMB 5 million and RMB 20 million.
Evaluation methods	AHP for indicator weighting; Input-output-oriented assessment for transformation efficiency; descriptive statistics and case analysis.

Source: Author's field investigation and questionnaire survey.

Findings and Discussion

Environmental Tax Implementation in Anyang

The environmental tax policy system in Anyang has gradually evolved into a structure combining national tax law, local implementation rules and supporting incentives. For major air pollutants such as sulphur dioxide and nitrogen oxides, the applicable tax amount in Anyang is RMB 4.8 per pollution equivalent, while the amount for water pollutants is RMB 5.6 per pollution equivalent. The local standard reflects a relatively strict pollution-control orientation compared with the provincial average. The principal local implementation indicators are consolidated in Table 2.

The scale and coverage of environmental tax collection have expanded. From 2018 to 2024, environmental tax revenue in Anyang increased from RMB 180 million to RMB 350 million, while the number of covered enterprises increased from 820 to 1,560. The share of SMEs among covered taxpayers rose from 72% to 85%, showing that environmental taxation increasingly affects smaller firms. By 2024, 127 SMEs had received environmental tax reductions or exemptions, with accumulated reductions of about RMB 98 million. However, this also means that many SMEs still could not access preferential treatment.

Table 2: Environmental Tax Implementation Indicators in Anyang

Indicator	Evidence from Anyang
Tax standard	Air pollutants: RMB 4.8 per pollution equivalent; water pollutants: RMB 5.6 per pollution equivalent.
Tax revenue	Increased from RMB 180 million in 2018 to RMB 350 million in 2024; average annual growth rate about 11.5%.
Coverage	Covered enterprises increased from 820 in 2018 to 1,560 in 2024; SME share rose from 72% to 85%.
Sector concentration	Steel, chemical and building-material industries contributed about 68% of environmental tax revenue.
Tax relief	127 SMEs obtained environmental tax reductions or exemptions by 2024; accumulated relief reached about RMB 98 million.

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Policy support	45 enterprises received special support after ultra-low-emission upgrading; average support about RMB 1.5 million per firm.

Source: *Compiled by the author from the Anyang Municipal Statistics Bureau (2024), Anyang Municipal Bureau of Ecology and Environment (2024), State Taxation Administration of the People's Republic of China (2024), relevant local policy documents, and the author's 2025 field investigation. Local figures are reported as administrative and case-study evidence for Anyang.*

Green Transformation Status of SMEs

The survey shows that SMEs in Anyang have a relatively high willingness to transform, but the transformation remains largely policy-driven. About 85% of respondents reported willingness to pursue green transformation. However, 50% described their transformation as a passive response to policy pressure, while only 35% reported active pursuit of green development. This indicates that the internal motivation for proactive transformation is still insufficient.

Transformation measures are concentrated in end-of-pipe treatment. About 70% of environmental investment was used for wastewater treatment stations, exhaust-gas treatment equipment and similar terminal facilities. Only 20% of firms adopted source-reduction measures such as clean energy substitution and process optimisation, while 10% experimented with circular economy practices. This pattern suggests that many SMEs treat environmental compliance as a short-term control task rather than a strategic innovation process.

The transformation outcomes are mixed. The average pollutant reduction among surveyed SMEs reached about 30% compared with 2018, while firms receiving environmental tax incentives achieved an average reduction of 45%. Energy efficiency increased by about 12% on average. However, 60% of firms reported a decline in profit of 5% to 10% due to high environmental investment, while only 30% achieved both environmental improvement and economic gain.

Transformation Mechanisms

The first mechanism is cost constraint. Environmental tax increases the cost of pollution and forces firms to calculate whether continued high-emission production remains economically viable. In high-pollution sectors, surveyed SMEs reported annual environmental tax expenses ranging from RMB 0.5 million to RMB 2 million, accounting for about 5% to 10% of total costs. This pressure encouraged short-term improvements such as better operation of treatment facilities and long-term investment such as process upgrading.

The second mechanism is policy incentive. Environmental tax reductions, subsidies and green credit can improve the financial return on green investment. For SMEs that qualified for tax reductions, the annual relief amount ranged from RMB 100,000 to RMB 500,000, accounting for about 15% to 20% of their environmental investment. The case of a new building-material company shows that tax relief and local subsidy support helped the firm build a solid-waste recycling production line, increasing solid-waste utilisation and revenue.

The third mechanism is market competition. Environmental tax reform strengthens market preference for greener suppliers and products. About 60% of surveyed SMEs believed that a good environmental image helped them obtain more orders. Large industrial buyers increasingly require upstream suppliers to meet environmental standards, while some

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consumer-facing firms benefit from green certification and brand recognition. Conversely, non-compliant firms face higher tax burdens, penalties and even production suspension.

Evaluation of Green Transformation Performance

The evaluation framework consists of three dimensions: economic benefits, environmental benefits and social benefits. Environmental benefits receive the highest weight because pollution reduction and energy efficiency improvement are the central goals of environmental tax reform. Economic benefits are also important because green transformation will not be sustainable if SMEs cannot recover costs or improve competitiveness. The indicators and AHP-derived weights are reported in Table 3.

Table 3: Proposed Evaluation Framework for SME Green Transformation

Dimension	Indicator	Weight	Indicator description
Economic benefits	Return on environmental investment	0.15	New profit after transformation divided by environmental investment.
	Cost reduction rate	0.12	Reduction in production or environmental cost after transformation.
	Green product price premium	0.08	Price increase of green products compared with ordinary products.
Environmental benefits	Pollutant reduction rate	0.20	Reduction in pollutant emissions after transformation.
	Energy efficiency improvement	0.18	Increase in energy efficiency after transformation.
	Solid-waste recycling rate	0.10	Share of solid waste reused or recycled.
Social benefits	New environmental jobs	0.05	Number of new environmental management or monitoring positions.
	Environmental training coverage	0.04	Share of employees receiving environmental training.
	Community satisfaction	0.03	Resident satisfaction with enterprise environmental performance.
	Environmental management system	0.03	Completeness of environmental management systems and procedures.
	Policy awareness	0.01	Firm understanding of environmental tax and support policies.
	Green certification	0.01	Number of green products, green factory or related certifications.

Source: *Author's AHP-based evaluation framework using expert scoring from 15 government, enterprise and university participants and indicators derived from the survey and study objectives.*

The overall performance was moderate. Only 25 firms, or 10.1% of the sample, achieved an excellent transformation level. A further 86 firms, or 34.8%, were classified as good. The largest group, 102 firms or 41.3%, remained at a general level, while 34 firms or 13.8% were rated poor. The average overall score was 58.6, indicating that SME green transformation in Anyang has moved from initial compliance toward improvement, but has not yet reached a

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high-quality transformation stage. The distribution of firms across performance levels is presented in Table 4.

Table 4: Overall Green Transformation Evaluation Results

Performance level	Score range	Number of firms	Share of valid sample	Interpretation
Excellent	≥80	25	10.1%	Mainly SMEs with strong technical foundations or close connection to large enterprises.
Good	60-80	86	34.8%	Firms with stronger willingness and better access to policy support.
General	40-60	102	41.3%	Firms relying mainly on end-of-pipe treatment with limited strategic upgrading.
Poor	< 40	34	13.8%	Micro or small firms with weak finance, technology and management capacity.

Source: *Author's 2025 questionnaire survey (247 valid responses) and AHP-based transformation evaluation. Percentages are calculated from the valid SME sample.*

The dimension-level results reveal an important imbalance. Environmental benefits achieved the highest average score of 72.3, suggesting that environmental tax pressure was effective in promoting emission reduction. However, economic benefits scored only 45.8, showing that many SMEs had not yet converted environmental investment into productivity improvement or market gains. Social benefits scored 56.2, reflecting progress in environmental management but insufficient public communication and stakeholder engagement. Industry differences were also clear: steel and chemical SMEs performed better than building-material and light-pollution sectors because they faced stronger tax pressure and received more policy support. Table 5 reports the dimension-level and industry-level results.

These findings support the conditional rather than universal version of the Porter hypothesis. The relatively strong environmental score indicates that regulatory cost pressure can change firm behaviour and improve pollution-control outcomes, consistent with the view that well-designed environmental regulation can encourage behavioural adjustment and innovation (Ambec et al., 2013; Porter & van der Linde, 1995). However, the much lower economic score shows that environmental improvement does not automatically translate into short-term profitability. This pattern is consistent with studies emphasising adjustment costs, heterogeneous firm capabilities, and delayed productivity effects under environmental regulation (Berman & Bui, 2001; Dechezlepretre & Sato, 2017; Gray & Shadbegian, 2003).

The Anyang evidence also extends prior SME research by showing how these capability constraints operate through implementation channels. Limited access to tax relief, weak policy communication, financing dependence, and shortages of technical services help explain why many firms remain concentrated in end-of-pipe treatment rather than source reduction or process innovation. These findings are consistent with previous research highlighting the importance of organisational capabilities in environmental management and the need for complementary finance, institutional support, and capability building for green transformation (World Bank, 2012; Zhang et al., 2008). The present findings therefore suggest that

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environmental taxation is most effective when regulatory pressure is matched by accessible incentives and adequate implementation support.

Table 5: Transformation Performance by Dimension and Industry

Category	score	Interpretation
Environmental benefits	72.3	Relatively strong; pollutant reduction averaged 30% and energy efficiency improved by about 12%.
Economic benefits	45.8	Weakest dimension; 60% of firms reported a profit decline of 5%-10% after environmental investment.
Social benefits	56.2	Moderate; 80% established environmental management systems, but community satisfaction remained limited.
Steel industry	68.5	Best-performing sector; pollutant reduction reached about 35% and energy efficiency improved by 18%.
Chemical industry	62.3	Good environmental results but weaker economic returns due to high investment costs.
Building-material industry	55.6	General performance; solid-waste recycling improved, but technical upgrading remained limited.
Other industries	48.3	Lower transformation pressure and weaker incentives led to slower transformation.

Source: *Author's 2025 questionnaire survey (247 valid responses) and AHP-based transformation evaluation. Industry and dimension scores are descriptive case-study estimates for the Anyang sample.*

Policy Constraints and Implementation Problems

Several constraints limit the effectiveness of environmental tax reform. First, policy accessibility remains insufficient. Although tax relief is available for enterprises with emission concentrations below legal thresholds, the cost of ultra-low-emission upgrading is too high for many SMEs. For example, desulphurisation and denitrification upgrading in steel-related SMEs may require RMB 5 million to RMB 10 million. Only 30% of surveyed firms reported the capacity to meet strict relief conditions, while 65% could not access tax reductions because of funding shortages.

Second, policy communication is inadequate. About 40% of surveyed SME managers reported that they did not clearly understand the details of environmental tax incentives, while 25% missed relief opportunities because they did not apply in time. This indicates that tax policy design alone is insufficient; policy transmission, guidance and application assistance are crucial for SMEs.

Third, interdepartmental coordination remains weak. Pollution monitoring data from environmental authorities are usually submitted to tax authorities after monthly aggregation, creating a delay of about 15 to 20 days. Differences in emission calculation methods also created disputes between firms and authorities. Such problems reduce policy credibility and increase compliance uncertainty.

Fourth, supporting services are insufficient. Subsidy coverage for SME green transformation was only about 20%, and subsidy amounts covered only 10% to 15% of transformation costs. Technology services were also limited; 60% of surveyed SMEs reported difficulty obtaining professional environmental technical support. Financing channels remained narrow, with 75%

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of green transformation financing relying on bank loans, often with higher interest rates and long approval periods.

Policy Implications

Enterprise-Level Measures

SMEs should improve internal green transformation capacity. First, they need staged environmental investment plans that separate low-cost short-term compliance measures from medium- and long-term source-reduction projects. Second, firms should appoint environmental compliance personnel responsible for facility operation, data recording, tax relief applications and communication with regulators. Third, SMEs should move beyond end-of-pipe treatment and gradually adopt cleaner production, waste recycling, energy-saving technology and process optimisation.

SMEs should also strengthen cooperation with universities, technology service providers and industry associations. Joint R&D, shared environmental facilities and green transformation alliances can reduce the individual burden of small firms and improve access to green finance.

Government-Level Measures

Local governments should adopt differentiated environmental tax and support policies. For high-pollution and non-compliant firms, the policy should maintain strict cost pressure. For light-pollution SMEs and firms willing to transform but temporarily unable to meet standards, transitional arrangements and targeted relief may be necessary. A one- to two-year transition period can reduce excessive survival pressure while still encouraging measurable improvement.

Interdepartmental coordination should be strengthened through a shared platform connecting environmental monitoring, tax calculation, declaration and policy evaluation. Unified calculation standards and joint enforcement guidelines would reduce disputes and improve policy credibility. In addition, green finance and direct subsidies should be expanded. A dedicated SME green transformation fund, interest-rate reductions for green loans and faster approval procedures can help reduce the financing barrier.

Social and Market-Level Measures

Green transformation cannot rely only on government pressure. Social participation and market incentives are also needed. Local governments and industry associations can promote green product awareness, support green supply-chain standards and encourage large firms to prioritise environmentally compliant SME suppliers. Public communication, enterprise open days and environmental information disclosure can also improve community trust and social supervision.

A coordinated ecosystem involving government, enterprises, financial institutions, universities, large buyers and communities is therefore necessary. Environmental tax reform will be more effective when cost pressure is matched with technology support, finance access and market reward.

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Conclusion

This study examined environmental tax reform and SME green transformation in Anyang, China. Based on field visits, interviews, 247 valid questionnaire responses and a multidimensional evaluation framework, the study found that environmental tax reform has substantially shaped SME behaviour through cost constraint, policy incentive and market competition mechanisms. The policy has helped improve environmental outcomes, especially pollutant reduction and energy efficiency. However, economic returns remain weak, and many SMEs still face high costs, limited technology access, weak policy understanding and financing difficulties.

The main conclusion is that environmental tax reform can drive green transformation, but its effectiveness depends on policy accessibility, implementation coordination and complementary support. A purely pressure-based approach may improve emission reduction in the short term, but it may not produce sustainable transformation if SMEs lack financial, technological and managerial capacity. Therefore, environmental tax policy should be integrated with green finance, technology services, differentiated support and market-based incentives.

This study has limitations. It focuses on one resource-based city and mainly uses cross-sectional field and survey evidence. The findings should therefore be interpreted as policy-oriented local evidence rather than causal estimates for all Chinese SMEs. Future research can extend the analysis to other resource-based cities, conduct longitudinal evaluation of environmental tax effects, and apply stronger econometric methods to estimate policy impacts on green innovation, profitability and firm survival.

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