An Overview of China's Legal and Policy Framework for Industrial Nitrous Oxide (N_2O) Mitigation

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I. Introduction

Industrial nitrous oxide (N_2O) is one of China's most cost-effective and verifiable climate mitigation opportunities: it has a high global warming potential (GWP), and its emissions come from a small number of concentrated industrial sources, making N_2O easy to both cut and monitor.

China's industrial N_2O policy framework is evolving amid a growing focus on non-carbon dioxide (CO_2) greenhouse gases (GHGs) in national climate governance.[1] For instance, the Industrial N_2O Emissions Control Action Plan establishes a dedicated policy framework for the adipic acid, nitric acid, and caprolactam sectors,[2] while broader national planning documents[3] and climate targets[4] are creating stronger incentives for implementation. The next step is for China to build on these policy and technical foundations by strengthening key requirements and integrating the policy tools into a comprehensive implementation system that delivers measurable, verifiable, and sustained reductions in industrial N_2O emissions.

This report explores pathways for advancing China's emerging industrial N_2O policy framework towards concrete implementation. It begins by mapping the broader policy structure that could support controlling industrial N_2O emissions, from overarching legal and planning frameworks—such as the Ecological and Environmental Code[5] and the Five-Year Plan system[6]—to implementation mechanisms including systems for:

- carbon emissions dual control;
- environmental impact assessment (EIA);
- pollutant discharge permitting;
- product carbon footprinting;
- monitoring;
- reporting and verification (MRV); and
- GHG emissions trading.

The report also reviews remaining implementation gaps, including the absence of binding emission-control requirements, the need to translate emerging monitoring and performance standards into mandatory facility-level MRV and enforceable compliance systems, and limited project-level financial incentives.

Additionally, this report identifies near-term opportunities to improve implementation, including:

- developing binding, sector-specific N_2O emission-control requirements and a supporting MRV framework;
- integrating N_2O emissions assessment into EIA and pollutant discharge permitting systems;

- developing robust China Certified Emission Reduction (CCER) methodologies for industrial N_2O mitigation projects;
- supporting local and sectoral pilots; and
- leveraging product carbon-footprint and supply-chain policies to incentivize verified emissions reductions.

Concurrently, further research can be conducted to promote alignment between domestic mitigation and international transparency and trade expectations.

II. Overview of key Chinese policies relevant to industrial N_2O mitigation

This section examines the overall policy framework that could support the control of industrial N_2O emissions in China. It examines relevant laws, planning frameworks, regulations, market-based approaches, and local pilot practices. It also explores how the framework could be applied or strengthened to improve project-level implementation by industry players.

a. National laws, planning documents, and Nationally Determined Contribution (NDC) commitments provide the legal and policy foundation for industrial N_2O mitigation.

China's 2035 NDC commitments provide an important policy foundation for advancing industrial N_2O mitigation. The 2035 NDC sets an economy-wide target to reduce net GHG emissions by 7–10% below peak levels by 2035.[7] The NDC document also highlights the importance of actively controlling non-CO_2 GHGs, including reducing N_2O emissions from the production of chemical raw materials like adipic acid.[8] The commitments give industrial N_2O mitigation a clear role within the broader 2026–2035 implementation agenda.

China's new Ecological and Environmental Code incorporates green and low-carbon development into the broader legal framework for ecology and the environment. It requires enterprises, public institutions, and other producers and operators to control GHG emissions and fulfill green and low-carbon development obligations.[9] It also brings EIA, ecological and environmental monitoring, information disclosure, pollutant discharge permitting, and liability for violations into a unified statutory structure.[10] Overall, the Code provides a stronger legislative basis for controlling industrial-process GHG emissions, including industrial N_2O emissions.[11]

China's 15th Five-Year Plan for National Economic and Social Development identifies key targets and priorities for economic and social development during 2026–2030, including those for climate change mitigation.[12] In particular, China's 15th Five-Year Plan sets a project-based target to build 30 million tonnes of CO_2-equivalent mitigation capacity by 2030. This goal is a combined total that spans methane, N_2O, and hydrofluorocarbon (HFC) reduction projects in coal mining, crop cultivation and livestock production, waste treatment, and chemical production.[13] The 15th Five-Year Plan for Building a Beautiful China and the 15th Five-Year Plan on National Climate Change Response reiterate the target while specifying eligible mitigation technologies, priority emission sources, and supporting measures for monitoring, verification, permitting, and carbon-market

implementation.[14] This sends a broader policy signal that China's road to carbon neutrality will increasingly require economy-wide, multi-GHG, and full-lifecycle mitigation. Industrial N_2O stands out as an ideal candidate for this shift because it is easy to cut and monitor, as noted earlier.

At the industrial policy level, the 15th Five-Year Plan reinforces this pathway by promoting the adjustment and upgrading of traditional industries; development of green manufacturing; improvement of standards; and stricter management of safety, environmental, energy-efficiency, and quality requirements.[15] This suggests that industrial N_2O mitigation could be integrated into quality improvements, green manufacturing, technological transformation, and standards updates within the petrochemical and chemical sectors.

The 15th Five-Year Plan also links industrial upgrading for energy conservation and carbon reduction by calling for stricter control of high-energy-consuming and high-emission projects, faster innovation and deployment of green and low-carbon technologies and equipment, construction of zero-carbon factories and parks, and improved mechanisms for assessing energy efficiency.[16] A recently released government policy document on energy conservation and carbon reduction provides further details on requirements for comprehensive review and evaluation of energy consumption, coal consumption, and carbon emissions for high-energy-consuming and high-emission industrial projects. This document also provides details on stronger management of energy-use reports, carbon-emissions inventories, energy audits, metering instruments, and information systems for key energy-consuming and carbon-emitting entities.[17] These provisions offer important guidance for industrial N_2O mitigation projects. For new, renovation, or expansion projects involving nitric acid, adipic acid, or caprolactam industries, N_2O mitigation measures could be integrated into the energy-conservation and carbon-reduction efforts.

b. China's Industrial N_2O Emissions Control Action Plan establishes the dedicated policy framework for industrial N_2O mitigation.

China's Industrial N_2O Emissions Control Action Plan is the core policy document for industrial N_2O mitigation.[18] The Action Plan provides that, by 2030, China will further improve policies for controlling industrial N_2O emissions; significantly strengthen innovation capacity for mitigation technologies; improve emissions-management capacity; raise the level of industrial N_2O recovery, utilization, and control; and ensure continued reductions in product-level N_2O emissions in the adipic acid, nitric acid, and caprolactam industries to internationally advanced levels.[19]

The Action Plan also sets out policy measures to support implementation, including promoting industrial N_2O technology, co-controlling air pollutants, and improving emissions monitoring.[20] It supports industrial N_2O mitigation projects through environment- and climate-finance mechanisms and encourages the use of China's voluntary GHG emissions trading program to motivate abatement.[21] Additionally, it promotes the inclusion of industrial N_2O mitigation technologies in the National Catalogue of Key Low-Carbon Technologies for Promotion, considers adding N_2O assessment to EIA for key industries, and calls for establishing an enterprise emissions reporting system that covers standards for monitoring and emissions as well as the automatic monitoring of industrial N_2O emissions, where feasible.[22]

Institutional coordination also supports the implementation of the Action Plan. On November 26, 2025, the Chinese government launched the Industry-Academia-Research Alliance for Controlling Industrial-Sector Nitrous Oxide (N_2O) Emissions in Beijing. The National Center for Climate Strategy and International Cooperation initiated the Alliance together with the China Nitrogen Fertilizer Industry Association, the China Chemical Energy Conservation Technology Association, key enterprises, and universities. The Alliance is expected to support implementation of the Action Plan by surveying major enterprises in the adipic acid, nitric acid, and caprolactam sectors; accelerating development of industrial-sector N_2O monitoring standards and research on N_2O emissions factors; promoting research, development, and deployment of N_2O emissions control technology and equipment; and strengthening international exchanges and cooperation in N_2O emissions control.[23]

c. Current standards and MRV tools provide the technical foundation for the implementation of industrial N_2O requirements.

China's national standardization system provides the technical foundation for regulatory implementation and MRV mechanisms related to climate pollutants, including industrial N_2O. However, enforceable emission-control requirements on industrial N_2O remain absent. Specifically, the current nitric acid pollutant-emission standard, GB 26131-2010, focuses on conventional pollutants like NO_x and does not set N_2O concentration limits, product-level performance benchmarks, or facility compliance thresholds.[24] In the absence of dedicated mandatory industrial N_2O emission-control standards, China has developed—and continues to develop—a range of technical standards and related measures that could support future regulatory and market-based approaches. This includes a draft voluntary "group standard" that establishes sector-specific N_2O abatement performance levels[25] and a proposed voluntary national standard that would establish a framework for classifying N_2O emission-control performance in nitric acid, adipic acid, and caprolactam industries.[26] This section examines these emerging performance benchmarks alongside accounting and reporting tools, monitoring and verification measures, integrated air pollutant/GHG inventory guidance, and sector-specific technical specifications. Collectively, these components are beginning to provide the technical architecture for a more comprehensive industrial N_2O regulatory system.

Regarding monitoring, China's Ministry of Ecology and Environment (MEE) conducted preliminary research in 2023 to develop ecological and environmental monitoring standards. This research included measurement methods and technical requirements for ambient-air methane (CH_4), CO_2, N_2O, and sulfur hexafluoride (SF_6), as well as testing methods for ambient-air GHG continuous monitoring systems.[27] For stationary sources, China's National Environmental Monitoring Centre has initiated suitability testing for CH_4/N_2O continuous emission monitoring systems (CEMS); it has also published lists of qualified products for stationary-source waste gas CO_2, CH_4, and N_2O continuous monitoring systems, with some listed instruments also covering flue-gas parameters.[28] More recently, the China Chemical Energy Conservation Technology Association released a draft voluntary group standard for public comment, titled the Technical Specifications for Continuous Direct Measurement Systems for Greenhouse Gas Emissions—N_2O in Industrial Exhaust Gas.[29] This draft standard covers continuous N_2O measurement systems for industrial exhaust gas from nitric acid, adipic acid, caprolactam, and similar production processes.

It provides for continuous measurement of N_2O concentration and calculation of emission rates and quantities, helping create a more standardized basis for facility-level N_2O emissions data. Although this represents a significant step toward a sector-specific industrial N_2O monitoring framework, the draft is a group standard focused principally on the technical performance and operation of measurement systems; it does not itself establish mandatory self-monitoring obligations for covered facilities or N_2O compliance thresholds. Therefore, it will be important to track how these emerging technical requirements are incorporated into enterprise GHG reporting, EIA, pollutant discharge permitting, regulatory data systems, and market-based crediting.

Regarding accounting and reporting, the main national accounting and reporting method for chemical production enterprises is China's Standard GB/T 32151.10-2023, titled Requirements of carbon-emissions accounting and reporting – Part 10: chemical production enterprise. This standard treats N_2O as an industrial-process GHG where relevant production processes are present, including nitric acid, adipic acid, and similar chemical processes. [30] For the nitric acid and adipic acid industries, N_2O emissions are generally calculated using product output, technology-specific N_2O generation or emissions factors, [31] NO_x/N_2O tail-gas treatment removal efficiencies or removal factors, and abatement system use efficiency or equipment utilization rates. At the provincial level, the 2025 Guidelines for Compiling Provincial Greenhouse Gas Inventories classify nitric acid, adipic acid, and caprolactam production as chemical-industry N_2O sources, supporting source identification; key-category analysis; and improvement of local activity data, emission factors, quality assurance (QA)/quality control (QC), and uncertainty analysis. [32] However, reporting gaps remain, especially for facility-level activity data, abatement-facility operating records, and the treatment of abnormal operating conditions.

On the subject of data quality and verification readiness, the aforementioned Standard GB/T 32151.10-2023 supports carbon-emissions accounting and reporting, including requirements for measurement/monitoring and data-quality management. [33] In addition, the 2025 Guidelines for Compiling Provincial Greenhouse Gas Inventories separately emphasize inventory-level QA and QC, uncertainty assessment, key-category analysis, documentation and archiving, and, where appropriate, review by personnel not directly involved in inventory preparation, preferably to include independent third-party review. [34] However, neither source offers detailed facility-level verification rules for industrial N_2O reporting. Future updates or new rules could further specify third-party verifier qualifications; conflict-of-interest safeguards; verification sampling and recalculation procedures; source-data traceability; calibration and QA/QC checks; treatment of missing or abnormal data; and consistency checks among monitoring records, production data, permit records, inventory data, and any claims made concerning the carbon market.

China's Technical Guidelines for Compiling Integrated Emission Inventories of Air Pollutants and Greenhouse Gases introduce an additional layer of technical management. [35] The Guidelines include N_2O within the GHG inventory scope and specify N_2O emissions from nitric acid and adipic acid production as industrial-source inventory items. [36] For these sectors, N_2O emissions may be calculated using chemical production enterprise GHG accounting and reporting methods, while verified N_2O data may be directly used for key enterprises already covered by GHG reporting and verification. The framework is especially helpful for aligning industrial N_2O accounting with

air pollutant inventory data, pollutant discharge-permit information, local source identification, data quality control, and coordinated GHG/air-pollution policy development and evaluation.

China is also making progress in developing sector-specific technical standards for industrial N_2O mitigation and emissions performance. Most notably, the China Chemical Energy Conservation Technology Association is developing a group standard titled Classification of Emission Control Levels for Industrial N_2O, which covers nitric acid, adipic acid, and caprolactam producers implementing N_2O control measures.[37] The draft establishes baseline, benchmark, and leading levels based on sector-specific N_2O reduction efficiencies: 60%, 80%, and at least 89% for nitric acid; 80%, 90%, and at least 95% for adipic acid; and 60%, 80%, and at least 90% for caprolactam.[38] It also specifies continuous N_2O monitoring requirements and establishes procedures for calculating annual abatement efficiency and assigning performance levels. Although the draft group standard would not itself require facilities to achieve a particular performance level, it could serve as the foundation for developing and implementing binding requirements, emissions-performance evaluation, voluntary mitigation mechanisms, and incentive policies. At the national level, a proposal to develop a voluntary national standard, Classification and Grading of Greenhouse Gas Emission Control Levels—Industrial N_2O, was published for public consultation from September 18 to October 18, 2026. The proposed standard would establish sector-specific N_2O emission-control performance levels, monitoring requirements, and performance assessment methods for nitric acid, adipic acid, and caprolactam production.[39] Additional sector-specific standards are in various stages of development and entry into effect. The Technical Specification for N_2O Emission Reduction in the Nitric Acid Industry was issued on February 13, 2026, and enters into effect on September 1, 2026.[40] A second voluntary standard, Guidelines for Nitrous Oxide Emission Reduction Technology in the Refined Adipic Acid Industry, remains under development.[41]

As next steps, China plans to strengthen industrial N_2O MRV by establishing a reporting system for key enterprises, researching and developing industrial-sector N_2O monitoring and emission-related standards, and exploring automatic monitoring of industrial N_2O emission sources.[42] Building on these emerging standards and MRV efforts, a key remaining task is to establish binding emission-control requirements, potentially drawing on the emerging performance levels, and to integrate them with facility-level monitoring and compliance systems.

d. EIA and pollutant discharge permitting systems can translate N_2O requirements into project- and facility-level management.

China's EIA system offers a proven, nationwide mechanism to address GHG emissions throughout project planning, design, and approval stages, which can be used for strengthened industrial N_2O management.[43] Since the Environmental Protection Law (Trial) was adopted in 1979, China has gradually developed its EIA system from a project-specific pollution prevention tool into a broader environmental management mechanism that covers both construction projects and plans under the Environmental Impact Assessment Law.[44] China has been systematically working to integrate climate change requirements into ecological and environmental management systems,[45] including ecological zoning, planning EIA, project EIA, discharge permitting, statistical surveys, monitoring, and accounting.[46]

China's "construction project" EIA policy provides that qualified regions may conduct EIA pilots [47] for construction projects whose emissions primarily include methane, N_2O, fluorinated gases, or other GHGs.[48] In China's EIA system, "construction project" is a legal term that refers broadly to project-level development activities that may affect the environment, including new construction, renovation, and expansion projects, not only building construction.[49] Accordingly, for new, renovation, and expansion projects in the nitric acid, adipic acid, caprolactam, and related sectors, project owners may eventually be required to identify N_2O emissions processes and describe raw-material routes, reaction-control conditions, tail-gas collection methods, catalytic or thermal decomposition facilities, expected reduction rates, abnormal operating-condition responses, and monitoring plans.[50]

China's pollutant discharge permitting system, including requirements for air pollutant emissions from stationary sources, can serve as a key operational tool for integrating N_2O mitigation into facility management. China's air pollutant discharge permitting system is designed to transform pollution-control obligations for stationary sources into enforceable, facility-level requirements, such as permitted pollutants, emission limits, monitoring, recordkeeping, and reporting. The Ecological and Environmental Code further strengthens this framework by establishing the discharge-permit system as the primary mechanism for supervising and managing stationary pollution sources. It requires that covered entities obtain pollutant discharge permits before releasing pollutants and applies differentiated permit management based on pollutant generation, discharge volume, and ecological and environmental impact. Future updates to chemical-sector permit provisions could include industrial N_2O emissions as managed items within permits, as well as for recordkeeping (ledgers), self-monitoring, and implementation reports. Over time, these requirements could align with enterprise GHG reporting, voluntary disclosure, and data submissions for carbon markets.[51]

Overall, the EIA and pollutant discharge systems can be used to incorporate N_2O mitigation into project and facility-management requirements. These tools are especially important because they help connect design-stage decisions, operating records, monitoring plans, and enforcement review.

e. Implementation of the carbon emissions dual-control system, including product carbon-footprint policies, can strengthen supply-chain incentives for verified N_2O reductions.

The 15th Five-Year Plan calls for comprehensive implementation of a dual-control system for carbon emissions—one that caps both total volume and intensity [52] —and for the steady implementation of local carbon assessments, sectoral carbon management, enterprise carbon management, project carbon evaluation, and product carbon-footprint policies.[53] Notably, product carbon-footprint policies[54] may be deployed to recognize and incentivize N_2O mitigation efforts. For nitric acid, adipic acid, caprolactam, and downstream products, product carbon-footprint rules can make manufacturing process N_2O emissions visible during procurement and supplier evaluations rather than leaving them only as facility-level compliance issues. As standards for product carbon footprints, carbon-labeling certification,[55] and background databases develop,

enterprises that can demonstrate verified N_2O abatement should be better positioned to make credible low-carbon product claims and respond to demand-side signals from downstream buyers.

China is developing methods to quantify the carbon footprints of adipic acid and nitric acid. The national standard drafting project for adipic acid is 20243820-T-606, titled Greenhouse gases - Carbon footprint of products - Quantification method and requirements - Refined adipic acid. This standard is under development as of this writing.[56] For nitric acid, the China Chemical Energy Conservation Technology Association has already approved and published the voluntary standard: GHG - Carbon footprint of products - Quantification method and requirements - Nitric acid.[57] Although voluntary, this standard is highly relevant to industrial N_2O mitigation because it requires process N_2O emissions from nitric acid production to be quantified based on nitric acid output, technology-specific N_2O generation factors, the removal efficiency of NO_x/N_2O tail-gas treatment equipment, and the equipment's utilization rate. These factors are then incorporated into the product's carbon footprint in CO_2-equivalent terms.[58] By making verified process N_2O reductions visible at the product level, this standard can support supplier screening, green procurement, carbon footprint and carbon label claims, and low-carbon supply-chain relationships.[59]

In summary, product carbon-footprint policies can help link verified industrial N_2O reductions with supply-chain assessment, demand signals, and broader industry incentives for N_2O mitigation. To support this process, however, strong MRV systems will be essential to ensure that reported reductions are credible, comparable, and accurately reflected in product-level carbon accounting.

f. Voluntary emissions trading, carbon-market linkages, and climate finance can provide early incentives for industrial N_2O mitigation.

China's national carbon-market system consists of two related but distinct components: the mandatory national emissions trading system (ETS), in which covered entities must surrender allowances for verified emissions, and the CCER, the national voluntary GHG reduction trading market that issues tradable credits for eligible voluntary emission-reduction projects. Under current national ETS rules, covered entities may use CCER credits to offset part of their allowance-surrender obligation, with the offset ratio capped at 5% of the allowances required for compliance.[60] The CCER rules also make project methodologies the technical basis for project design, validation, monitoring, verification, and credit registration.[61] When these methodologies mature, they may be integrated into the national standards system.[62] This is relevant for industrial N_2O, because the Industrial N_2O Emissions Control Action Plan calls for accelerating the use of voluntary GHG reduction trading and other market mechanisms to encourage industrial N_2O mitigation.[63]

China's recent national carbon-market policy updates send stronger medium-term signals for both mandatory and voluntary markets. For instance, the 2025 Opinion on Promoting Green and Low-Carbon Transition and Strengthening the National Carbon Market provides that, by 2027, the national carbon emissions trading market should basically cover the major emitting industries in the industrial sector, and that the national voluntary GHG reduction trading market should achieve full coverage of key fields.[64] By 2030, the Opinion calls for a national carbon emissions trading

market based on total allowance control, combining free and paid allocation, and for a national voluntary GHG reduction trading market that is credible and transparent, uses unified methodologies, has broad participation, and is aligned with international practice. [65] It also calls for a carbon-pricing mechanism with clear mitigation effects, a sound rules system, and reasonable price levels. [66]

For industrial N_2O, these targets strengthen the case for developing high-integrity CCER methodologies in the near term. Such methodologies could provide the technical basis for project design, validation, monitoring, emissions-reduction accounting, verification, and credit registration, while also laying the groundwork for mature technical specifications for possible future inclusion in the national standards system.

Furthermore, the EU-Brazil-China Open Coalition on Compliance Carbon Markets remains important, although it is primarily focused on compliance carbon markets and domestic carbon-pricing systems.[67] The Coalition's focus areas—robust MRV systems, sound carbon-accounting methodologies, and the potential use of high-integrity offsets to promote environmental integrity—are relevant to China's broader work on carbon-market integrity and methodology quality.[68] For industrial N_2O, developing high-integrity CCER methodologies can serve a practical purpose: providing near-term project-finance incentives and limited compliance-offset flexibility where ETS rules permit CCER use while also establishing the baselines, monitoring protocols, accounting methods, and verification practices that could later support the incorporation of mature CCER methodologies and related technical specifications into the national standards system.[69]

In summary, market- and climate-finance tools can help address the initial cost barrier for industrial N_2O mitigation. The 2027 and 2030 carbon-market targets and relevant provisions in the Industrial N_2O Emissions Control Action Plan create a clear policy window for developing industrial N_2O CCER methodologies, climate-finance pipelines, and project-level MRV systems, while allowing mature methodologies and related technical specifications to be considered for incorporation into the national standards system when conditions are ready.

g. Local and sectoral pilots can test practical approaches before national requirements are fully standardized.

Local and sectoral industrial N_2O mitigation pilot programs are still in their early stages. However, Ningxia has issued an industrial N_2O emissions control implementation plan that involves creating a list of key emitting entities; conducting surveys of adipic acid, nitric acid, and caprolactam enterprises; and promoting source control, end-of-pipe mitigation, and resource utilization.[70] This local plan serves as a useful example of early local implementation.[71]

Regions with strong industrial bases might lead the way in conducting baseline verification for key enterprises, automatic monitoring pilots, and emission-accounting and reduction-verification pilots. These pilots can generate replicable methods for monitoring locations, operating-condition records, data quality control, and evaluation of mitigation technologies. Demonstration projects may also produce technical and economic analyses, verification experience, regulatory checklists, and templates that could be used in other regions.

Ultimately, local and sector-specific pilots can test the practical details of industrial N_2O implementation before nationwide requirements are further strengthened. These pilots will generate not only emissions reductions, but also replicable case studies for national deployment.

III. Recommendations for strengthening China's law and policy framework for industrial N_2O mitigation

The following recommendations aim to align the national policy framework with enterprise-level implementation to help China meet its goal of reducing product-level N_2O emissions in the adipic acid, nitric acid, and caprolactam industries to internationally advanced levels by 2030. China can start with sectors where emissions are highest and abatement technologies are more developed while also building the capacity for monitoring, reporting, verification, financing, supply chains, and local governance needed for wider implementation. This core strategy can lower implementation risks and generate early case studies that can be expanded across provinces and industries.

a. Develop binding emission-control requirements and strengthen supporting technical standards for key sectors.

China could build on emerging voluntary standards and existing mitigation guidance by moving toward binding, sector-specific N_2O reduction requirements. The draft group standard that establishes baseline, benchmark, and leading abatement performance levels provides an initial technical basis for such requirements,[72] while emerging monitoring standards can support measurement and compliance.[73] Binding requirements could draw on these performance levels and be paired with other metrics, such as product-level emission-intensity benchmarks. These requirements could then be integrated into EIA, pollutant discharge permitting, or other facility-level compliance mechanisms.

For adipic acid, binding requirements could establish effective tail-gas capture and treatment, minimum abatement efficiency, reliable operation of control equipment, and product-level N_2O emission-performance indicators. For nitric acid, requirements could similarly build on existing in-furnace and tail-gas abatement approaches, including catalyst performance and optimization, while exploring opportunities to integrate N_2O controls with the existing NOx regulatory and monitoring framework. For caprolactam, additional sector-specific data and demonstration may be useful before adopting binding facility-level requirements.

The key next step is therefore to move from voluntary performance levels and technical guidance to enforceable sector-specific requirements. This approach would allow China to build on the technical foundation already under development while providing enterprises with a clearer, more durable compliance signal for sustained N_2O mitigation.

b. Develop a robust accounting and MRV framework for industrial N_2O implementation.

Reliable accounting and MRV systems are crucial for both regulatory enforcement and market incentives. A robust MRV framework would provide the common technical foundation for multiple policy approaches: regulatory compliance, EIA follow-up, discharge-permit records, CCER methodology development, product carbon-footprint accounting, and supply-chain claims. Therefore, MRV guidelines should be designed to produce traceable facility-level records that can be verified against production data, abatement equipment operations, monitoring results, inventory reports, and any crediting or product-level claims.

China could build on the emerging technical specification for continuous direct measurement systems by developing the regulatory and institutional rules needed for facility-level application, including self-monitoring requirements for key industries, QA/QC requirements, and procedures to link monitoring data to regulatory and market-based systems. When appropriate, key enterprises may be required to include N_2O emission points in their self-monitoring plans and to deploy automatic monitoring systems connected to the data networks of the ecological and environmental authorities.

For enterprises that do not use continuous automatic monitoring, rules may specify production load, facility pollution-control operating status, sampling conditions, analytical methods, original-record retention, and data quality control requirements for manual monitoring. Third-party monitoring, operation and maintenance, validation, and verification institutions should also be subject to qualification requirements, conflict-of-interest rules, quality checks, and exit mechanisms.

China could also consider accelerating the development of localized emission factors.[74] Monitoring data from key enterprises and supervisory authorities, sectoral research, and demonstration projects could be used to improve emission factors for the nitric acid, adipic acid, and caprolactam industries. These factors may be integrated into the national GHG emissions factor database over time.

c. Incorporate industrial N_2O requirements into project EIA and pollutant discharge permitting systems.

Building on experience with carbon emission EIA pilots in key industries,[75] China could create technical guidance for evaluating N_2O emissions from priority chemical construction projects.[76] For new, expansion, or modification projects involving nitric acid, adipic acid, caprolactam, and related processes, EIA documents could be required to include identification of N_2O emissions-generating processes, emissions projections, source control measures, end-of-pipe treatment technologies, expected abatement performance, controls during abnormal operating conditions, and post-commissioning monitoring plans.

EIA approvals could specify key abatement facilities, monitoring plans, and operational requirements. Compliance could then be reviewed during environmental protection approval upon project completion, discharge-permit implementation reporting, and subsequent enforcement

inspections. Discharge permits could include coordinated industrial N_2O management requirements through permit attachments, ledgers, self-monitoring plans, and implementation reports. In the near term, these requirements will work best as recordkeeping, monitoring, and coordinated management items. Over time, as sectoral standards and monitoring methods are strengthened, permit-based requirements may also become a stronger operational link between project approval, facility operation, data reporting, and enforcement review.[77]

The main point is that EIA and discharge permitting provide a practical way to include N_2O controls in project design and facility operation. This approach helps ensure that mitigation measures are considered early and then tracked through routine regulatory oversight, while allowing the legal and technical basis for stronger permit-based requirements to develop over time.

d. Mobilize CCER and climate-finance mechanisms for verified industrial N_2O reductions.

China's national policy aims for the voluntary GHG reduction trading market to fully cover key areas by 2027 and to develop into a transparent, methodologically unified, broadly participatory, and internationally aligned voluntary market by 2030.[78] Industrial N_2O projects could support China's broader carbon-market development efforts by delivering high-integrity non-CO_2 mitigation results with relatively concentrated sources, mature abatement options, and measurable reductions.[79]

In the near term, China could focus on developing CCER methodologies for industrial N_2O mitigation projects. These methodologies might define project boundaries, baselines, additionality, monitoring frequency and methods, key-parameter recordkeeping, treatment of abnormal operating conditions, and verification rules.

Since industrial N_2O crediting can generate large volumes of reductions from relatively concentrated sources, the methodology development should prevent over-crediting, weak baselines, or double-counting with product carbon-footprint claims, enterprise reporting, or future regulatory requirements. In practice, methodology development may proceed alongside monitoring pilots and facility-level data-quality improvements.

Methodology development can also rely on international and historical precedents. For adipic acid, the Climate Action Reserve's China Adipic Acid Production Protocol provides a China-specific example for quantifying, monitoring, reporting, and verifying reductions from N_2O control technologies at adipic acid plants.[80] For nitric acid, the Article 6.4 Supervisory Body's 2026 adoption of a methodology for reducing N_2O emissions from nitric acid production is especially relevant because it connects proven abatement technologies with credit generation under the Paris Agreement Crediting Mechanism.[81]

Industrial N_2O mitigation projects could also be supported through climate and green finance.[82] Project packages could be developed for end-of-pipe decomposition retrofits, domestic catalyst substitutions, automatic monitoring systems, and demonstration projects for key enterprises. These packages could be linked with green credit, green bonds, green factories and parks, technology-retrofit support, and local climate investment and financing pilots.

e. Leverage product carbon-footprint and supply-chain incentives for sustained industrial N_2O reductions.

China could enhance the use of product carbon-footprint policies to recognize verified reductions of industrial N_2O emissions. For nitric acid, adipic acid, caprolactam, and downstream products, standards for product carbon footprints, carbon label certifications, and green procurement rules could be developed to account for process N_2O emissions and verified abatements. This strategy would help turn facility-level mitigation efforts into product-specific information that downstream buyers can use for supplier evaluation, procurement decisions, and claims for low-carbon products.

This pathway may be especially useful where industrial N_2O regulatory requirements are still being developed because supply-chain incentives can motivate early adopters without the need for immediate industry-wide mandates. However, the value of this approach depends on credible accounting. Product carbon-footprint rules should therefore be linked with enterprise MRV, abatement-facility operating records, verification procedures, and any relevant CCER or project-level accounting methods. Clear rules are also necessary to prevent double-counting or inconsistent claims.

The key takeaway is that China's product carbon-footprint and supply-chain policies can help turn verified industrial N_2O reductions into demand-side incentives. They can significantly contribute to near-term N_2O mitigation alongside direct regulatory requirements on emissions control and reduction.

f. Support local and sectoral pilots as case studies for national deployment.

China could launch integrated industrial N_2O pilot projects in regions with concentrated production capacity, robust regulatory frameworks, and willing enterprises. This approach would follow China's practice of testing climate governance tools before broader rollout, as demonstrated through carbon emission EIA pilots[83] and regional carbon-trading pilots that preceded the national ETS.[84] Industrial N_2O pilot activities could include enterprise baseline surveys, self-monitoring plans, automatic monitoring and data-transmission trials, localized emission-factor development, trial use of EIA guidance, coordinated discharge-permit management, CCER project preparation, and product carbon-footprint accounting.

At the sectoral level, China could build on the Industry-Academia-Research Alliance for Controlling Industrial-Sector N_2O Emissions as a coordination platform while also creating enterprise-led or project-specific technology deployment workstreams where needed.[85] Such workstreams could involve operational arrangements among specific enterprises, engineering-design firms, catalyst manufacturers, research institutions, monitoring and service providers, and verification bodies to deliver real-world projects, test equipment, develop monitoring protocols, manage data quality, and document performance.

The value of these pilots extends beyond immediate emission reductions. Well-designed pilots can create useful templates for monitoring plans, handling abnormal operating conditions, verification checklists, EIA reviews, permit attachments, financing packages, and product carbon-footprint data. They could also help identify barriers to implementation, including equipment costs,

maintenance capacity, data quality issues, local enforcement capacity, and coordination challenges among enterprises, regulators, monitoring institutions, and verification bodies.

Therefore, pilot projects can reduce uncertainty and build implementation capacity. Their main value lies in creating replicable tools that national agencies, local governments, and enterprises can customize as broader requirements are developed.

g. Advance international alignment and external recognition of industrial N_2O mitigation.

International alignment may help improve the credibility, comparability, and external recognition of China's industrial N_2O mitigation efforts. The 2025 Opinion on Promoting Green and Low-Carbon Transition and Strengthening the National Carbon Market emphasizes making the voluntary GHG reduction trading market credible, transparent, methodologically unified, broadly participatory, and aligned with international practice by 2030. China could participate in international discussions on fundamental MRV systems, product carbon-footprint rules, and high-integrity market crediting approaches while ensuring that domestic policies remain consistent with China's regulatory requirements and industrial conditions.

Industrial N_2O is a strong candidate for international alignment because its sources are relatively concentrated, abatement technologies are commercially available, and reductions can be measured and verified through high-integrity methodologies. In this sense, industrial N_2O could serve as a practical area for testing functional comparability between Chinese and international approaches. Better consistency between Chinese MRV rules, emissions factors, product carbon-footprint methods, and international approaches could enhance CCER quality improvement, support recognition of low-carbon supply chains, and enable more credible disclosures by enterprises and downstream buyers.

As noted in Section II.F, the EU-Brazil-China Open Coalition on Compliance Carbon Markets focuses on compliance carbon markets rather than the voluntary CCER market, but it remains a useful reference for robust MRV rules, sound accounting practices, and high-integrity credit offsets. For international alignment of the CCER market, industrial N_2O could serve as a practical demonstration case, allowing China to use CCER methodology development to demonstrate verifiable reductions and build monitoring protocols, accounting methods, and verification practices that align with global high-integrity carbon-market governance.

China could also assess how international product carbon-footprint rules, supply-chain emission-disclosure requirements, green procurement systems, and low-carbon product claims may affect nitric acid, adipic acid, caprolactam, and downstream products. This analysis could help ensure that domestic N_2O mitigation supports both climate benefits and industrial competitiveness while minimizing future risks associated with inconsistent accounting, weak claims, or limited recognition of Chinese mitigation data.

IV. Conclusion

China's industrial N_2O framework has evolved from broad policy recognition to a more specific implementation framework. The Industrial N_2O Emissions Control Action Plan provides the dedicated policy foundation for the adipic acid, nitric acid, and caprolactam sectors, while various planning, regulatory, and policy documents offer strong entry points for implementation. These include the 15th Five-Year Plan, China's 2035 NDC, the Ecological and Environmental Code, emerging voluntary performance and monitoring standards, EIA system, pollutant discharge permitting, product carbon-footprint policies, CCER, and other climate financing mechanisms, as well as subnational industrial N_2O emissions control implementation plans.

This report examines how China can build on existing policy and technical foundations and integrate relevant policy tools into an implementation framework that delivers measurable, verifiable, and sustained reductions in industrial N_2O emissions. Its main goal is to inform the development of a comprehensive implementation system that links binding sector-specific requirements, robust MRV, project EIA, pollutant discharge permitting, market and finance incentives, product carbon-footprint management, and pilot implementation.

A practical pathway is to begin with sectors where emissions are concentrated and abatement options are relatively mature, while using local and sectoral pilots to test implementation models. The Industry-Academia-Research Alliance for Controlling Industrial-Sector N_2O Emissions can support knowledge exchange, technical discussions, and stakeholder engagement. Specifically, dedicated stakeholder workstreams can be developed to demonstrate the deployment of abatement technology, MRV best practices, data management, and performance evaluation.

Data quality and institutional coordination are essential. Effective implementation requires reliable activity data, appropriate monitoring methods, clear procedures for handling abnormal operating conditions, traceable records of abatement equipment, qualified third-party verification, and consistency across enterprise reporting, inventories, permit records, product carbon-footprint claims, and any CCER or other market-based claims.

International alignment can further strengthen this pathway by boosting the credibility, comparability, and external recognition of China's industrial N_2O mitigation efforts. Greater consistency with high-integrity MRV, carbon-footprint, and crediting practices can support CCER methodology development, low-carbon supply-chain recognition, and credible enterprise disclosure while still allowing China to tailor approaches to domestic industrial conditions.

By developing binding requirements and integrating emerging standards, MRV, EIA, market incentives, and product carbon-footprint tools into a comprehensive implementation system, China can advance industrial N_2O mitigation from policy commitment to sustained, verifiable emissions reductions.

V. Acronyms

CCER	China Certified Emission Reduction
CEMS	CH_4/N_2O continuous emission monitoring systems
CH_4	methane
CNEMC	China National Environmental Monitoring Centre
CO_2	carbon dioxide
CO_2-equivalent	carbon dioxide equivalent
EIA	environmental impact assessment
ETS	emissions trading system
GHG	greenhouse gas
HFC	hydrofluorocarbon
MEE	Ministry of Ecology and Environment
MIIT	Ministry of Industry and Information Technology
MOFCOM	Ministry of Commerce
MRV	monitoring, reporting, and verification
N_2O	nitrous oxide
NBS	National Bureau of Statistics
NDC	Nationally Determined Contribution
NDRC	National Development and Reform Commission
NO_x	nitrogen oxide(s)
QA	quality assurance
QC	quality control
SAC	National Standardization Administration
SAMR	State Administration for Market Regulation
SF_6	sulfur hexafluoride

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