

## Supporting Information A

# The contribution and mitigation potential of reactive nitrogen emissions from industrial parks in China can not be ignored

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**Summary: Supporting information contains 9 pages, 4 Figures and 2 Tables.**

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24 The main purpose of the Supporting Information is to provide the standard for the classification of the industrial  
25 parks (IPs) and a substance flow analysis of Nr in the IPs. In addition, some accompanying tables and figures are also  
26 presented on this Supporting Information.

## 27 **1. Classification of IP types**

28 The types of IPs are classified according to national standards compiled by the National Bureau of Statistics of  
29 China (GB/T 4754-2017) <sup>1</sup>. The criteria for the classification of IPs are as follows: If the output value of one of the  
30 pillar industries exceeds 50% of the total output value of the IP, the pillar industry is dominant, and the IP is divided  
31 into the professional categories to which the pillar industry belongs. For example, the pillar industries of an IP include  
32 chemical, textile printing and dyeing, and machinery manufacturing industries. Among them, the output value of the  
33 chemical industry exceeds 50% of the total output value of the IP. It is considered that the chemical industry is the  
34 leading industry of this IP; thus, the IP is divided into chemical parks. If the IP contains many types of pillar industries,  
35 and the output value of each pillar industry does not exceed 50% of the total output value of the IP, the IP is divided  
36 into comprehensive parks. For special IPs in which the pillar industries cannot be classified into the main industry  
37 classification by the national standard <sup>1</sup>, they are classified into the other type. The specific basis for the classification  
38 of the park industry based on the pillar industries of the IP is shown in Table S1.

## 39 **2. Substance flow analysis**

40 Ammonia nitrogen (NH<sub>3</sub>-N) in industrial wastewater is the main cause of water pollution (such as red tides and  
41 eutrophication of water bodies) <sup>2</sup>. The NH<sub>3</sub>-N in industrial wastewater is mainly hydrated ammonia. The substance  
42 stream that is converted to N can be calculated from the molecular mass of ammonia and N (molecular mass: NH<sub>3</sub>-  
43 N:N=17:14).

44 Nitrogen oxide (NO<sub>x</sub>) refers to a compound composed only of two elements: N and oxygen <sup>3, 4</sup>. Common NO<sub>x</sub>  
45 compounds are nitric oxide (NO), nitrogen dioxide (NO<sub>2</sub>), nitrous oxide (N<sub>2</sub>O), and dinitrogen pentoxide (N<sub>2</sub>O<sub>5</sub>) <sup>5</sup>.

46 Except for NO<sub>2</sub>, other nitrogen oxides are extremely unstable and become NO<sub>2</sub> or NO when exposed to light,  
47 humidity or heat. NO<sub>x</sub> in industrial flue gases is often referred to as NO and NO<sub>2</sub><sup>3, 5</sup>. In calculating the average mass  
48 concentration of NO<sub>x</sub>, it can be assumed that  $\frac{Q(NO_2)}{Q(NO_x)} = 0.75$ <sup>6</sup>. Therefore, the elemental flow of NO<sub>x</sub> can be  
49 calculated from the relative molecular mass of N.

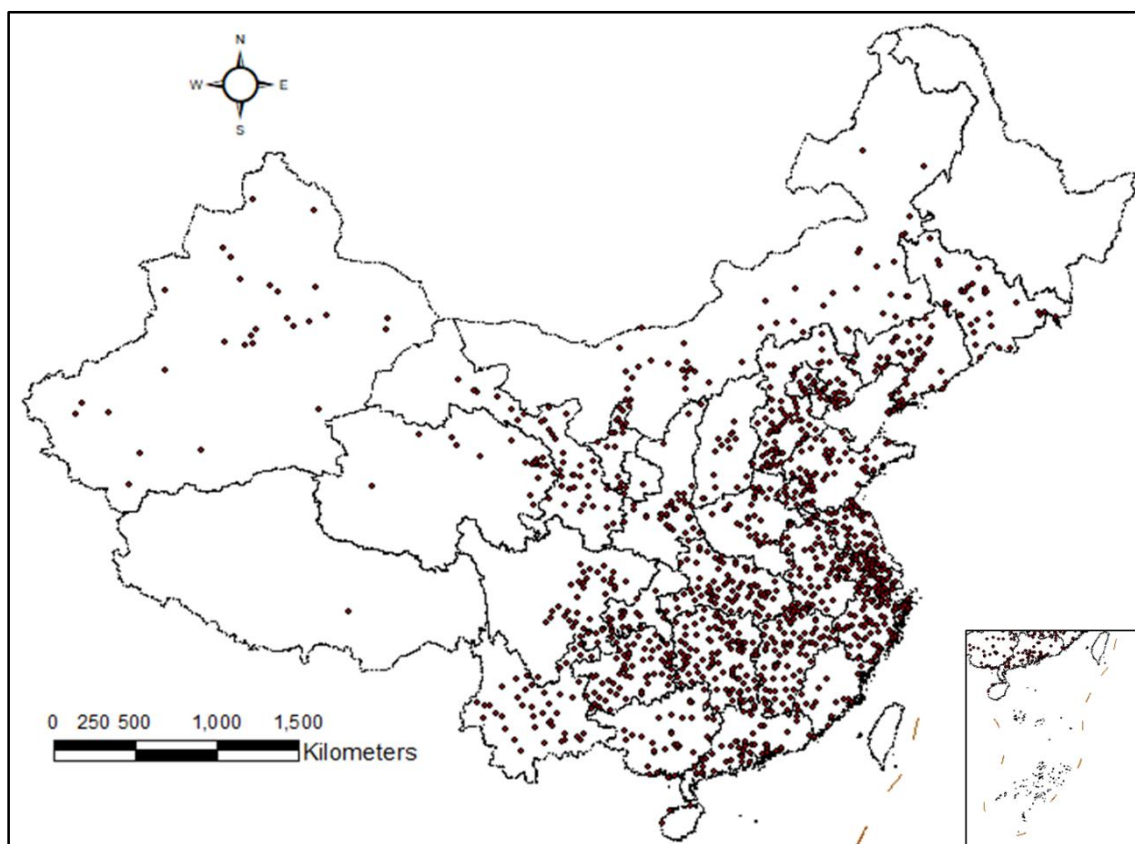
50 There is a large difference in solid waste generated in IPs in different industries or sectors. Therefore, we consider  
51 the difference in the N content of different industries when converting nitrogenous industrial solid waste. The N  
52 content of solid waste discharged from various types of IPs is presented in Table S2.

53 At the national level, Nr emission data (including NO<sub>x</sub>, NH<sub>3</sub>-N and nitrogenous solid waste from industries) across  
54 China are extracted from the China Statistical Yearbook on the Environment<sup>7</sup>. The calculation method is the same  
55 as that for the IP described above. For economic data, the gross domestic product (GDP; the unit is Chinese Yuan,  
56 CNY) is obtained from the China Statistical Yearbook<sup>8</sup>.

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59    **3. Figures: Figure S1-5**



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61                      Figure S1 Geographical locations of Chinese IPs.

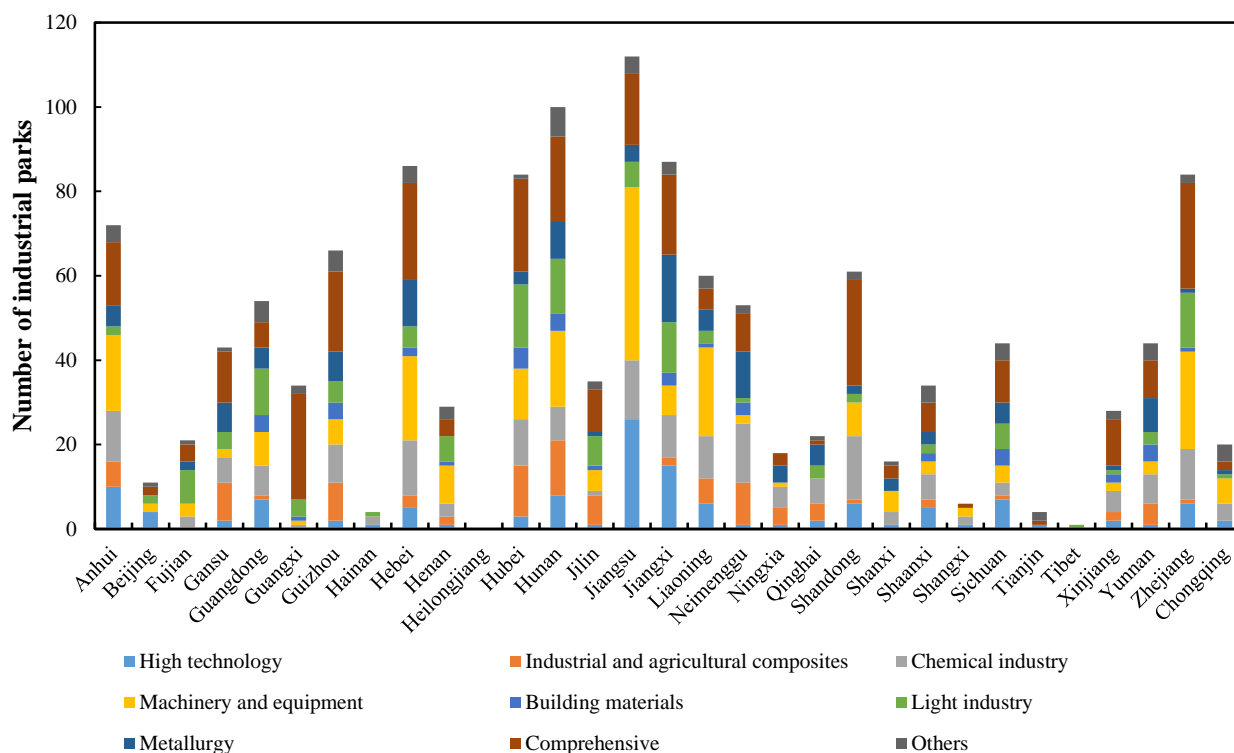


Figure S2 The number of IPs of various types in each Chinese province. Note: Data for Heilongjiang, Taiwan, Hong Kong and Macau are not available.

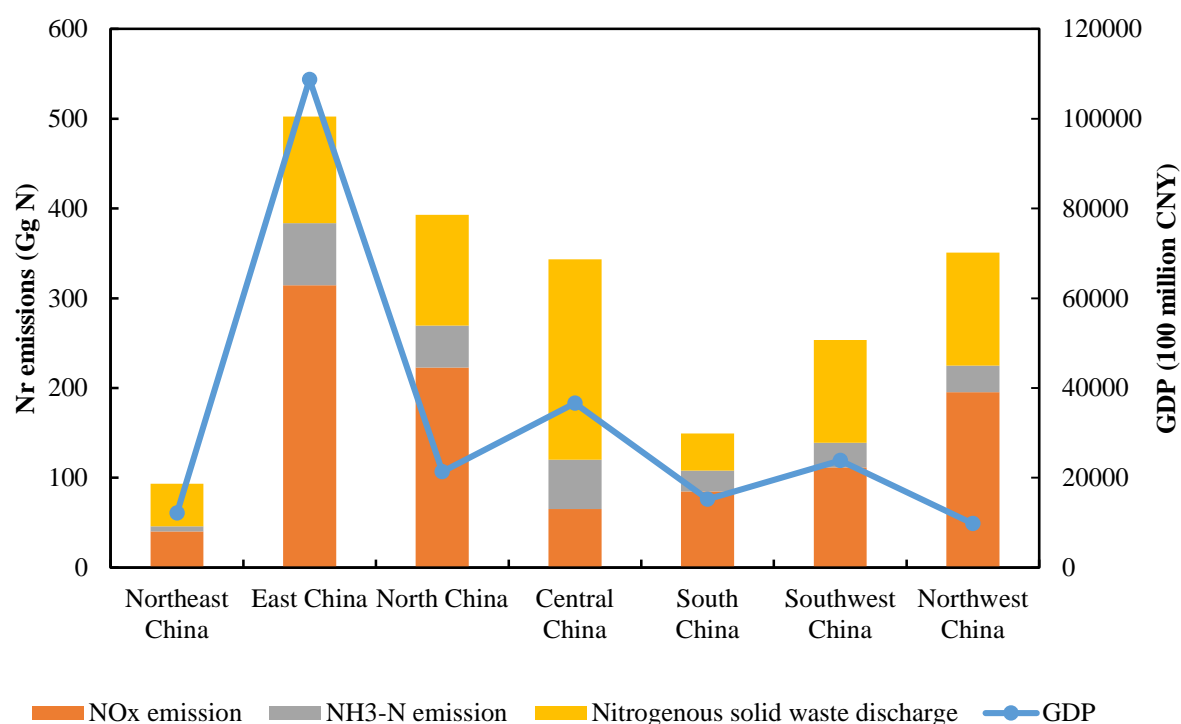


Figure S3 Nr emissions and GDP in the seven geographical regions of China's IPs.

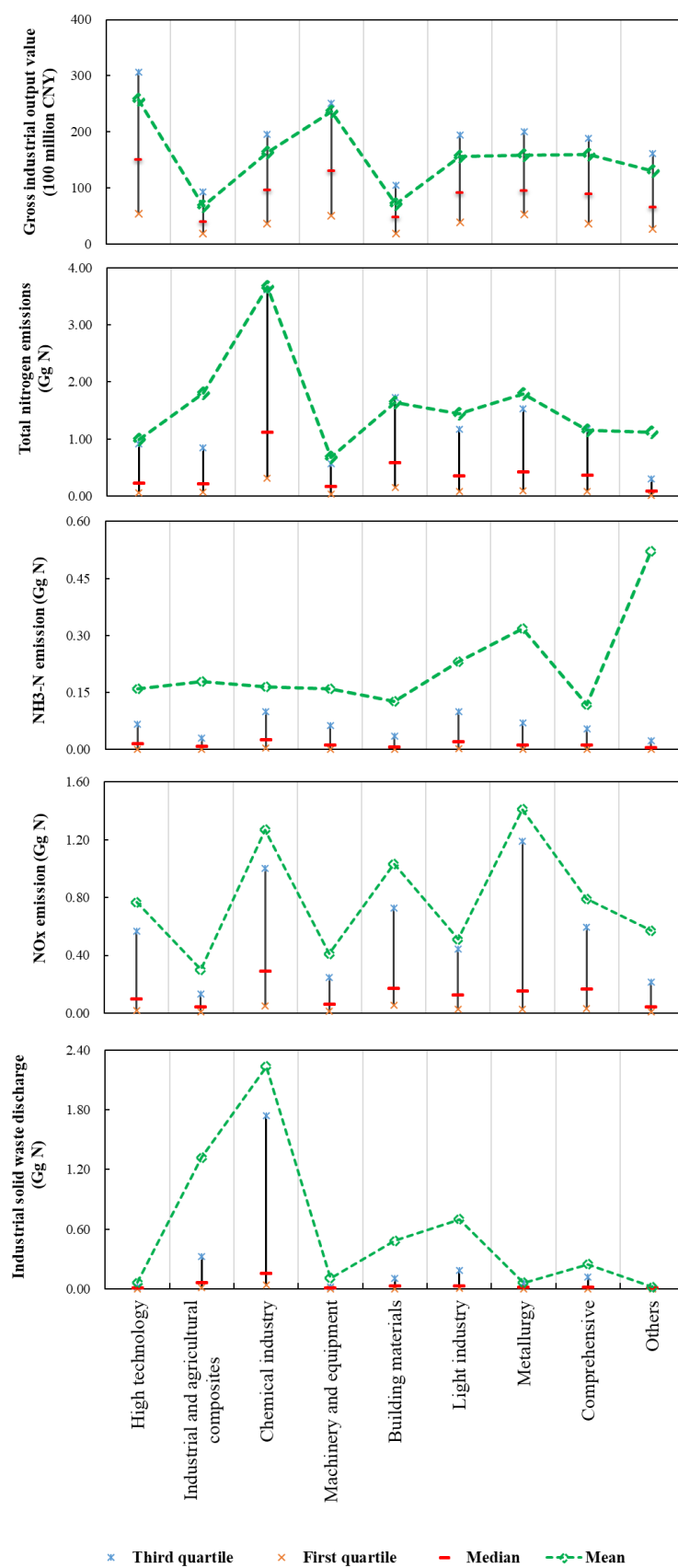


Figure S4 Comparison of the quantiles and means of IPs in different industrial categories.

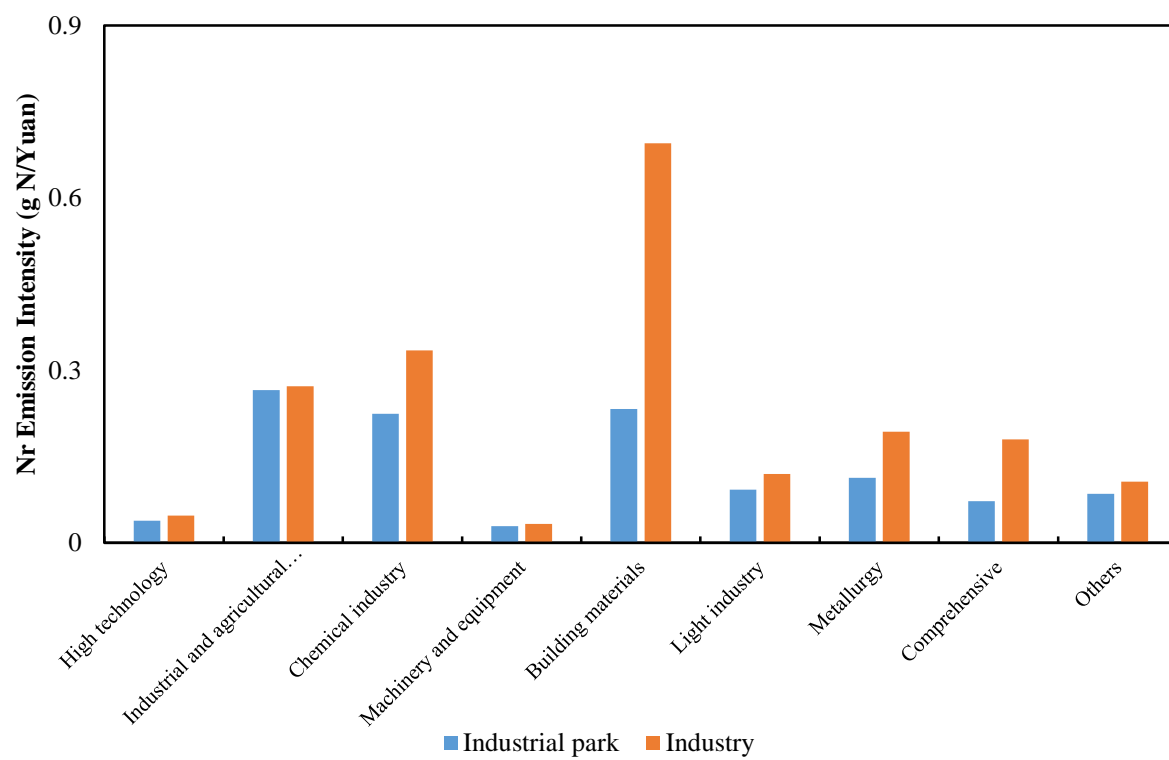


Figure S5 Comparison of the Nr emission intensity from different types of IPs and industries in China.

72 **4. Tables: Table S1-S2**

73 Table S1 Standards for the division of pillar industries in IPs.

Type of IP	Pillar industry
High-tech	Emerging industries, such as electronic information, biomedicine, new material, and new energy industries
Industrial and agricultural composites	Agriculture, forestry, animal husbandry and fishery, Chinese herbal medicine cultivation, deep processing of agricultural products, etc.
Chemical industry	Chemical raw materials and chemical manufacturing, chemical fiber manufacturing, rubber and plastic products, petrochemicals, etc.
Machinery and equipment	General equipment manufacturing; special equipment manufacturing; automotive manufacturing; railway, marine, aerospace and other transportation equipment manufacturing; electrical machinery and equipment manufacturing; computer, communications and other electronic equipment manufacturing; and instrumentation manufacturing
Building materials	Building materials, cement, composites, industrial ceramics, fiberglass manufacturing, etc.
Light industry	Food manufacturing; wine, beverage and refined tea manufacturing; tobacco products; textiles; textiles and apparel; apparel; leather; fur; feathers and their products; footwear; wood processing; bamboo; tanning; brown and grass product manufacturing, paper industry; and printing and recording media reproduction industry
Metallurgy	Ferrous metal smelting and rolling processing industry, nonferrous metal smelting and rolling processing industry, metal products industry
Comprehensive	Including three or more different types of industries with a balanced proportion
Others	Outside the above range, such as logistics, tourism services, bonded areas, etc.

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75 Table S2 Nitrogen content of industrial solid waste discharged from different types of IPs.

Type of IP	Nitrogen content from industrial solid waste (%)	References
High-tech	0.05	
Industrial and agricultural composites	1.80	6, 9-12
Chemical industry	0.68	
Machinery and equipment	0.05	



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Building materials	0.20
Light industry	0.50
Metallurgy	0.01
Comprehensive	0.10
Others	0.01

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