

气候友好型大气污染控制战略

Policy Recommendations for Integrating Climate-Friendly Air Pollution Control Strategy into China's 12th Five-Year Plan



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November 13, 2009

I、“十二五”大气污染防治

I. National Air Pollution Control in the 12th Five-Year Plan

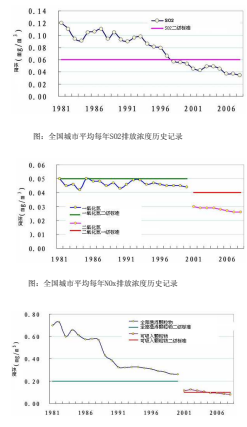
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1、“十一五”大气污染防治效果

1. Expected Effect of Air Pollution Control Under 11th Five-Year Plan

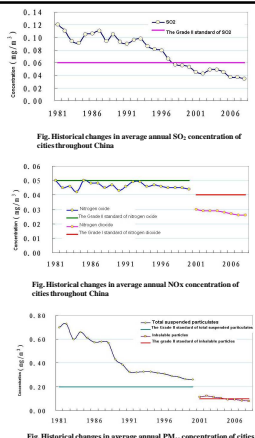
- “十一五”以来，各地以二氧化硫减排为重点，积极进行燃煤电厂烟气脱硫，关停淘汰火电、钢铁、水泥等行业落后产能，拆除、改造中小型燃煤锅炉，使城市空气中SO₂和PM₁₀浓度明显降低，但依然维持在较高水平。
- Since the inception of China's 11th Five-Year Plan, reduction of SO₂ emissions has been prioritized; flue-gas desulphurization has been adopted in coal-fired power plants; outdated facilities such as coal-fired power plants, steel plants, and cement plants have been closed; and small-medium scale coal-fired boilers have been removed and refurbished. All these have greatly reduced the concentration of SO₂ and PM₁₀, but the emission levels of SO₂ and PM₁₀ remain high.

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- 2008年，全国城市SO₂年均浓度较2005年下降13.3%
- 2008年，全国城市PM₁₀年均浓度较2005年下降14.9%
- 2008年，全国城市NO₂年均浓度未发生明显变化

来源：中国环境监测总站，2008
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- 13.3% reduction in average annual SO₂ concentration in Chinese cities between 2005 and 2008
- 14.9% reduction in average annual PM₁₀ concentration in Chinese cities between 2005 and 2008
- No dramatic changes in NO₂ concentration in Chinese cities between 2005 and 2008

Data Source: China National Environmental Monitoring Centre, 2008.
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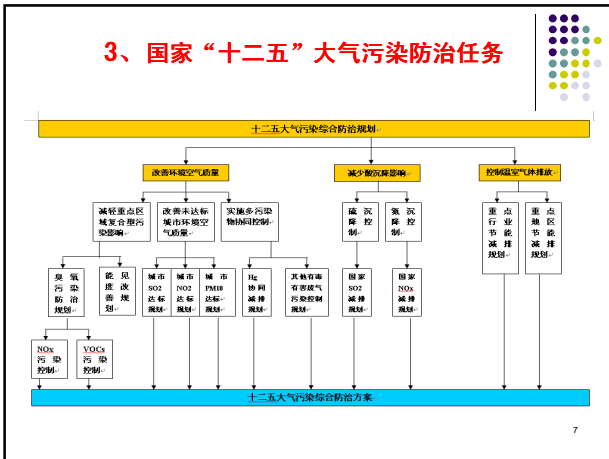
2、国家“十二五”大气污染防治策略

2. Strategy for Air Pollution Control Under 12th Five-Year Plan

- 多污染物综合控制
- 多污染源协同减排
- 多尺度防治全面推进
- 全方位全过程系统控制
- 基于减排—效应响应关系的科学控制
- 气候变化与大气污染协同控制
- Integrated multiple-pollutant control strategy
- Coordinated emission reduction of multiple pollution sources
- Advancement of multi-dimension control
- Multi-faceted comprehensive system process control
- Scientific control based on the relation between emission reduction and outcome
- Coordinated control of climate change and air pollution

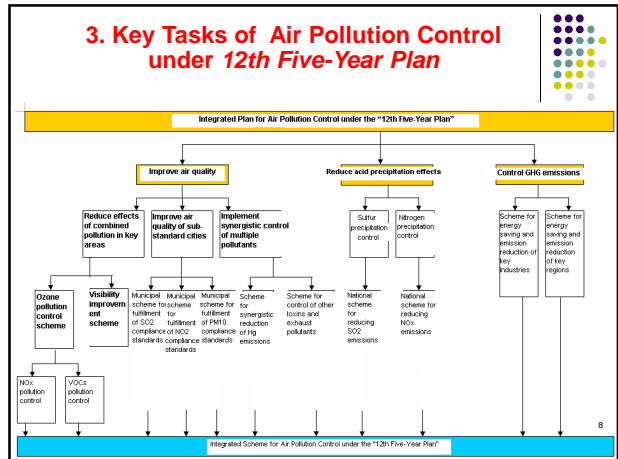
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3、国家“十二五”大气污染防治任务



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3. Key Tasks of Air Pollution Control under 12th Five-Year Plan



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4、可能的SO₂和NO_x排放控制目标

4. Proposed TEC Objectives of SO₂ and NO_x

• 二氧化硫控制目标建议。中国2007年的二氧化硫排放总量为2468万吨，其中电力行业二氧化硫排放量为1245万吨。根据《国民经济和社会发展第十一个五年规划纲要》对二氧化硫排放总量削减10%的要求，2010年全国的二氧化硫总量控制目标为2295万吨。

• Proposed objectives of SO₂ control: China's aggregate SO₂ emissions amounted to 24.68 million tons in 2007. Of this, the power sector emitted 12.45 million tons. To achieve the objective that the aggregate amount of SO₂ emissions should be reduced by 10% during the 11th Five-Year Plan period, the aggregate SO₂ emissions should be limited to no more than 22.95 million tons for 2010.

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4、可能的SO₂和NO_x排放控制目标

4. Proposed TEC Objectives of SO₂ and NO_x (cont.)

• 氮氧化物控制目标建议。预计2010年氮氧化物排放量将达到2300万吨。

• Proposed TEC objectives of NO_x: It is estimated that China's aggregate amount of NO_x will reach 23 million tons by 2010.

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II、实施气候友好型大气污染防治战略 II. Formulation of Climate-Friendly Air Pollution Control Strategy

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1、提高气候友好大气污染防治的意义认识

1. Necessity and importance of implementing climate-friendly air pollution control strategy

• 温室气体排放与大气污染物“同源同步”
• 气候变化与大气污染相互交叉影响
 ✓其一，矿物燃料燃烧所排放的污染物，如黑碳气溶胶、N₂O不但造成空气污染，而且还具有明显的气候效应；
 ✓其二，由温室气体增加所引起的气候变化也能影响空气污染问题，可加重和放大空气污染对人体健康、农业生产和生态系统的影。

• Greenhouse gas emissions and air pollutants are "same source and same path"
• Climatic changes and air pollution interact
 ✓ First, pollution caused by the consumption of mineral fuels (black carbon aerosol, N₂O, etc.) will result in air pollution and have obvious effects on climatic change;
 ✓ Second, climatic changes caused by the increase of greenhouse gas emissions could have an effect on air pollution, which will increase and amplify the effects of air pollution on public health, agricultural production and the ecological system.

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应对气候变化与常规大气污染防治密不可分，不能厚此薄彼，必须采取综合、一体化、协同的防治策略，即气候友好的大气污染防治方略。

- 首先是常规大气污染物减排措施及目标要与温室气体排放控制措施及目标相互协调，不能彼此冲突；
- 其次是通过控制温室气体排放措施与常规大气污染物减排措施的优化组合，以最小的成本实现既定的气候与环境目标。

It is necessary to formulate and implement a comprehensive, integrated and cohesive strategy for climate-friendly air pollution control.

- First, the conventional measures and objectives for air pollution control should be synergistic with measures and objectives for greenhouse gas emissions control;
- Second, the proposed objectives for climate change control and environmental protection can be achieved at minimum costs via the optimal use of greenhouse gas control measures and conventional measures for air pollution control.

气候友好型的环境保护战略对于像中国这样的发展中国家是非常重要的，因为它能够更成本高效地治理大气污染和气候变化

图：中国实施气候友好型环境保护策略的协同效应-GAINS-Asia 模型分析

图：中国实施气候友好型环境保护策略的协同效应-GAINS-MERGE 模型分析

来源：Johannes Bollen. 大气污染和全球气候变化：复合成本-效益分析 2009

A climate-friendly environmental protection strategy is particularly important for a fast-growing developing country like China, because it can solve air pollution and climate change problems in a more cost-efficient.

Fig. Synergistic effect from implementation of climate-friendly environmental protection strategy in China simulated by GAINS-Asia module

Fig. Synergistic effect from implementation of climate-friendly environmental protection strategy around the world simulated by MERGE module

Date source: Johannes Bollen. Local air pollution and global climate change: A combined cost-benefit analysis. 2009

2、气候友好的大气污染防治规划框架

- 第一，对于空气污染问题的识别，要全面分析局地、区域以及全球环境问题。
- 第二，对于大气污染源的分析，要综合考虑常规大气污染物排放与温室气体排放源，综合考虑点源、线源与面源。
- 第三，削减目标包括两个部分：局地污染物和温室气体。目标应指向减少健康和社会福利的影响，而不是任意地设定减排目标。为对应的削减所设立的时间范围应该是可行的。
- 第四，排序选择最优化的可以达到所有空气质量目标的措施。在制定与实施控制规划时，必须考虑多种污染的协同控制，确保可以应对地方减排目标，同时也可以支持或者至少不会妨碍温室气体稳定或减排这个目标。
- 第五，对于控制计划的回顾与修订，应将其作为一个不可或缺环节。只有不断回顾与修订规划，才可达持续改善区域环境空气质量的目的。

2. Framework of climate-friendly air pollution control plan

- 1) To identify air pollution problems, all aspects of local, regional and global environmental matters will be analyzed.
- 2) To analyze sources of air pollution, the emissions sources of conventional pollutants and greenhouse gases will be included, and comprehensive consideration will be given to point sources, linear sources and diffused pollution.
- 3) The emission reduction target is comprised of two parts: local pollutants and greenhouse gases. The target will focus on reduction of negative impacts on health and social welfare instead of on the arbitrary establishment of any emission reduction target.
- 4) The emission reduction measures combined with the optimized ranking selection are capable of achieving all air quality targets. In the process of establishing and implementing the control plan, coordination of multiple pollutant control will ensure that the local emission reduction target can be achieved, at the same time supporting (or at least not hindering) greenhouse gas stabilization and emission reductions.
- 5) Review and amendment of the control plan should be a necessary step. Only through constant review and amendment of the control plan can a continuous improvement in regional environmental air quality be achieved.

3、气候友好的大气污染防治实施时序

3. Schedule for implementation of climate-friendly air pollution control plan

基于目前实际状况，气候友好型大气污染防治方案很难在全国范围内实施，要广泛的建立气候友好型大气污染防治体系需要经历中长期过程。

- Under the current circumstances, the climate-friendly air pollution control plan is difficult to implement throughout China. The comprehensive establishment of a climate-friendly air pollution control system will need to take place on a medium and long-term basis.

3、气候友好的大气污染防治实施时序

3. Schedule for implementation of climate-friendly air pollution control plan (cont.)

近期：“十二五计划” (2011-2015)
 Short term: 12th Five-Year Plan (2011-2015)

• 该阶段属于准备阶段，其重点是：在现行的环境管理体系中逐步加强考虑气候变化的应对，重点抓好N₂O与黑碳气溶胶的协同减排，将控制CO₂与CH₄等温室气体排放增速纳入重点区域或重点行业规划，着手制定和实施自愿性的气候友好型城市空气质量改善规划；全面加强环境保护部门应对气候变化支持能力的建设，提高环境保护部门应对气候变化的科学性和前瞻性。

• The preparatory stage of the control plan has the following priorities: in the existing environmental management system, gradually enhance the counter-measures to climate change, actively coordinate emissions of N₂O and black carbon aerosols, incorporate the control of greenhouse gas emissions, control CO₂ and CH₄ emissions in key areas and/or key industries, and establish and implement a voluntary climate-friendly urban air quality improvement plan. In addition, strengthen the environmental protection department's efforts in combating climate change and enhance scientific decision-making within the environmental protection department in order to combat all aspects of climate change.

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3、气候友好的大气污染防治实施时序

3. Schedule for implementation of climate-friendly air pollution control plan (cont.)

中期：“十三五计划” (2016-2020)
 Medium term: 13th Five-Year Plan (2016-2020)

• 该阶段属于示范实施阶段，其重点是推广低碳示范，建立节能减排绩效评估与碳排放审计体系，对非重点区域的工业企业、政府机构、公用事业单位、服务业单位碳排放强度进行测算、评估，并出台配套的激励政策。

• The demonstration and implementation stage will emphasize promotion of low carbon emissions and establishment of energy-efficient emission reduction performance assessment and carbon emission auditing systems; call for the estimation and assessment of carbon emission intensity within industrial enterprises, governmental agencies, public institutions and service enterprises in normal regions; and issue the supporting incentive policy.

长期：“十四五计划” (2021-2025)
 Long term: 14th Five-Year Plan (2021-2025)

• 该阶段属于战略调整阶段，最终目标是全面建立气候友好的环境保护体系。

• The final target of the strategic adjustment stage is to establish the climate-friendly environmental protection system.

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4、气候友好的大气污染防治的重点任务

4. Key tasks for climate-friendly air pollution control plan under 12th Five-Year Plan

1) 高度重视黑碳气溶胶及其控制的重要性
 1) Attach great importance to the control and management of black carbon aerosol emission

—控制城市面源黑碳气溶胶排放
 —Control black carbon aerosol emissions of urban diffuse source pollution

—控制火电行业黑碳气溶胶排放
 —Control black carbon aerosol emissions within the coal-fired power generation industry

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4、气候友好的大气污染防治的重点任务

4. Key tasks for climate-friendly air pollution control plan under 12th Five-Year Plan (cont.)

2) 控制N₂O排放
 2) Control N₂O emission

—电力行业N₂O排放控制以低氮燃烧为主，烟气脱硝为辅
 —N₂O emission control within the power industry emphasizes low nitrogen combustion and considers flue gas denitrification

—机动车N₂O排放控制以严格排放标准、加强排放控制管理为主
 —Automotive vehicle N₂O emission control emphasizes strict emission control regulation

—硝酸工业N₂O控制以引入CDM机制为主
 —N₂O control within the nitric acid industry emphasizes introduction of the CDM mechanism

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4、气候友好的大气污染防治的重点任务

4. Key tasks for climate-friendly air pollution control plan under 12th Five-Year Plan (cont.)

3) 在重点地区和行业建立CH₄排放控制试点项目
 3) Conduct pilot control of CH₄ emission in key areas and industries

—控制重点区域油气工业甲烷排放
 —Control methane emissions within the oil and gas industries

—控制重点区域煤炭开采业甲烷排放
 —Control methane emissions within the coal mining

—控制重点区域固体废物处理与污水处理过程中的甲烷排放
 —Control methane emissions in the processing of solid waste and sewage disposal

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4、气候友好的大气污染防治的重点任务

4. Key tasks for climate-friendly air pollution control plan under 12th Five-Year Plan (cont.)

4) 在重点地区和行业建立CO₂排放控制试点项目
 4) Conduct pilot control of CO₂ emission in key areas and industries

—优化能源消费结构，加快可再生能源的开发利用
 —Optimize the structure of energy consumption and accelerate the development and utilization of renewable, clean energy sources

—开发节能技术，提高能源利用效率
 —Develop energy efficiency technology and improve energy utilization efficiency

—优化产业结构和产品结构
 —Optimize industrial and product structure

—建设一批燃煤电厂二氧化硫、氮氧化物、汞、二恶英、二氧化碳协同控制示范工程，推动CO₂工程减排的发展
 —Construct projects that promote reduction of emissions (i.e. carbon dioxide, nitrogen oxide, mercury and dioxins) in coal-fired power plants and promote the development of CO₂ emission reduction projects

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5、气候友好的大气环境管理措施建议

5. Key measures for climate-friendly air pollution management

- 1) 将温室气体排放纳入环境统计体系
- 2) 监测温室气体浓度

- 1) Incorporate greenhouse gases into the environmental statistics system
- 2) Monitor the concentration of greenhouse gases

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5、气候友好的大气环境管理措施建议

5. Key measures for climate-friendly air pollution management (cont.)

- 3) 在试点城市建立气候友好型环境政策和措施

- 3) Establish system for climate-friendly environmental protection policies and measures in pilot cities

- 建立考虑气候效应的环境影响制度
- 建立碳排放审计体系
- 建立低碳的资源价格政策体系
- 创新低碳环保技术的管理制度
- 建立促进低碳环保技术和产品推广的市场激励机制

- Establish a system to monitor the environmental impact in terms of climate effect
- Establish a system of auditing carbon emissions
- Establish a policy of resource pricing for a low carbon economy
- Innovative management system for low carbon environmental technology
- Establish market incentive mechanism for the promotion of low carbon environmental technology and product commercialization

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5、气候友好的大气污染治理措施建议

5. Key measures for climate-friendly air pollution control plan (cont.)

- 4) 为发展低碳经济制定并实施相应的的碳税政策

- 4) Duly release carbon tax policies to develop low carbon economy

- 简单税基：对煤、石油、天然气等化石燃料按含碳量测算排放量作为计税依据
- “等着看”：碳税起征时间宜为2012年，预告制度
- 低筹集资金：按照碳税率为20元/tC计算，2012年中国碳税收入将达到400亿元左右，约占中国GDP的0.1%；若2020年征收碳税率为50元/tC，碳税收入则将达到1800亿元左右。
- 绿色使用：碳税收入应重点用于对可再生能源发展和企业节能的鼓励，而不作为国家税收的收入来源

- Simple tax base: taxation should be based on the amount of emissions calculated according to the carbon content of fossil fuels such as coal, petroleum and natural gas
- “Wait and See”: it is appropriate to levy the carbon tax from 2012, with notification of the specifics in advance
- Low function of fundraising: tax collection for carbon in China in 2012 will reach about 40 billion RMB, accounting for 0.1% of GDP in China, if the tax rate for carbon is calculated at 20 RMB/tC. Carbon tax income will reach around 180 billion RMB if the tax rate for carbon in 2020 is 50 RMB/tC
- Green utilization: the carbon tax income is considered an incentive for renewable energy development and energy efficiency within enterprises, instead of as a source of national tax revenue

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6、开展自愿性二氧化碳碳排放贸易试验

6. Voluntary carbon emission trading program in some regions and industries

- 在特定区域（如CO₂排放量大城市、排放强度大城市）探索性开展碳排放交易
- 在特定行业内，如电力和汽车行业开展与能效和二氧化碳总量控制与相结合的自愿排放交易

- In select areas (such as provinces and cities with high or intense CO₂ emissions), pilot carbon emission trading programs
- In the electricity generation and automotive production industries, enact voluntary emissions trading and include control of sulfur dioxide emissions in performance evaluation.

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6、开展自愿性二氧化碳碳排放贸易试验

6. Voluntary Carbon Emission Trading Program in Some Regions and Industries (cont.)

- 特定企业群（如企业集团、自愿注册承诺减排或控制的企业）探索自愿贸易
- 交易：增量控制信用、总量减排信用、节能信用、不同信用之间的交易等

- In specified enterprise clusters (such as enterprise groups and those voluntarily committed to ensue pollution emission reduction and control), explore the possibility of voluntary trading
- Trading: this refers to allowable trading with incremental control credit, overall emission reduction credit, energy efficiency credit, and other credits

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