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## **Growth, Environment, and Politics; the Case of China**

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## **Abstract**

The controversial relationship between economic growth and environment in China has gained worldwide attention in the context of the global warming and ecological disaster that herald a changing global climate. China is seen widely in the international community as a nation that prizes only economic growth at any cost, oblivious of the devastating growth-induced pollution. This assertion is too simplistic to unerringly hone in on the real issues of China.

Ultimately, the environmental degradation inflicted by the pollution-intensive technology employed by Chinese industries will make China's robust economic growth more difficult. The post-Mao ZeDong government showed some concern for the environment and placed fairly comprehensive environmental protection laws in place. Faced with the growing, plaguing problems of acid rain, dwindling clean water supply, desertification, deforestation, and substandard air quality, the Beijing government, only recently beginning in the late 1990s, began seriously to look beyond the past era of sustained high growth. The question thus remains: Will China under the current authoritarian regime be able to continue with its robust growth and to resolve the problems of egregious pollution?

This paper starts with an overview of China's development policy and its consequences from the recent past historical perspective. We then look into a statistical evidence of relationship between economic growth and environmental degradation for China. In explaining changes in the environment, we examine how large the explanatory power the government policy has, and analyze its policy consequences for the Chinese people. Finally, the paper concludes with the policy actions required for the environment protection, domestically as well as internationally.

## **I. Profile of the Economy**

The Chinese economy's unprecedented growth has garnered considerable international scrutiny. The past four decades saw China's gradually transforming from an inward-oriented economy to an outward-oriented one. The unprecedented growth has raised the average living standards of its people, drastically reducing the poverty rates. It has, however, created unprecedented damages to its environment. This precarious predicament between economic progress and environmental preservation continues to persist today. The problem has been amplified by China's past development.

### **A. Post-Mao Development**

China's multifaceted growth represents the culmination of nearly four decades of evolving economic policy. Following the Communist victory in the Chinese Civil War, Mao Zedong assumed the supreme authority in China. From 1949 to 1977, the dogmatic vision of Maoism prevented the Chinese economy from exhibiting any real progress. Mao's dedication to continuous revolution led to the Cultural Revolution and other forms of social upheaval. In addition, an ideological rivalry with the Soviet Union led to extremely limited international aid for a nation already openly embracing isolationism. The economy was unable to gather any momentum and China was mired in poverty.

Upon Mao's death, Deng Xiaoping assumed control of Chinese government and ushered in an era of economic reform. Emphasizing pragmatism in economic policy, Deng gradually liberalized the economy, opening the door to foreign trade and investment. With the help from the newly-formed, state-guided business elite class in the nation of what is referred to as "Red Capitalist", China started on the arduous path toward labor- and energy-intensive industrialization. The subsequent leaders Jiang Zemin and Hu Jintao furthered China's national goal for robust economic growth.

## **B. The Current Economy**

China's skyrocketing GDP currently ranks as the world's second largest at \$8 trillion in PPP. The average annual growth rates over the past 15 years hovered around 12% in contrast to those of the United States which stayed at 2.5% (Figure 1). The robust economic growth has lifted astonishing 500 million Chinese out of poverty in the country with the world's largest population of over 1.3 billion. China extended its influence far beyond the regional Asia economies to Latin America and Africa. It is well to note, however, that despite China's accomplishment in massive wealth accumulation income inequality has been rising since 1997 (Figure 2).

On top of this problem of growing inequity and as the country is faced with the ongoing global recession, its leaders are worried about social stability and unrest. They have decided to backtrack and focus less on foreign ventures and more on domestic markets. In accordance, the Chinese People's National Congress (PNC) officially with the proclamation of the 12<sup>th</sup> Five-Year Plan, called for domestic stimulus packages aimed at raising the grass-roots population's living standard.<sup>1</sup> Massive road projects and infrastructure buildings in rural China have currently been underway. The plan also called for the banking reforms to ensure financial security in the face of uncertain global financial future.

### **C. Energy Needs.**

A distinctive feature behind China's dazzling success is that its industries as the main force of growth relied on use of cheap energy resources, in particular unfettered use of coal. China turned to various methods of producing energy. Coal burning power plants continue, however, to account for about 80% of all energy resources in China (Figure 3). With the industrial growth rates far surpassing the GDP growth, the regional and federal coalmines have persistently been exploited to meet the industrial needs as the cheapest source of energy resources (Figure 4). Coal burning is among the most environmentally harmful means of generating energy.

As China's toxic environment and accompanying international pressure began to prompt the country to turn to "greener" energy sources. The government has been heavily investing in hydropower and air power for several years now. The recent completion of the Three Gorges Dam illustrates China's interest in hydropower. Nuclear power research has similarly received governmental funding in an effort to curb reliance on coal power.

Despite these efforts for alternative energy generation, the sheer need for energy is so large that a majority of power still has to come from coal-based power plants. China has additional difficulties in meeting growing energy demands for housing and transportation. Economic growth has always been heavily export-based, despite a recent national emphasis on providing for domestic consumers.<sup>2</sup> Thousands of manufacturing plants for exports also require power. Despite these government efforts to switch to sustainable energy sources, the ballooning new consumer demands for power are making the change more difficult and protracted. The most controversial byproduct of China's need for energy will be the environmental degradation over the foreseeable future.

Most industrial processes that involve large-scale production of energy give rise to copious amounts of pollution. China's use of coal accounts for a third of global coal supply. China has also begun importing mineral resources, and its oil consumption has been steadily rising (Figure 5). The fossil-fuel using plants are extremely harmful to the environment, releasing toxic fumes into the air that create other environmental problems like acid rain. Some efforts to embrace sustainable energy production have also destroyed priceless ecosystems. The Three Gorges Dam project flooded much of the original Yangtze River valley. While newer, more sustainable methods of energy production are constantly being formulated, the burgeoning economy's insatiable need for energy is destroying the environment. The government has long recognized energy-production's destructive impact on the environment and made ineffective, limited attempts to institute reform measures as early as in the late 1970s.

## **2. Strategy and Development**

### **A. Policy Dilemma**

The post-revolution Chinese government has shown a half-hearted concern with the environment by occasionally enacting proactive legislation to curb the pollution, always without compromising economic growth. The first Chinese National Conference on Environmental Protection occurred in Beijing as early as in August 1973. This conference was only able to agree on the basic sustainability principles, such as recycling, and to agree to the idea that public participation would be necessary for holistic environmental protection.<sup>3</sup> As China's economic climb became accompanied by a steadily rising need for cheap, pollution-intensive energy resources, greater efforts were made by occasional new environmental legislation. The 1978 effort that culminated with the Law of Environmental Protection was more remarkable. This legislation created a strict, streamlined process that all new building projects were required to follow. Each new construction site was to undergo an inspection by officials of the System of Environmental Impact Assessment (SEIA). Subsequent reports must be submitted for formal government approval.

China moved further ahead with the 1989 Environmental Protection Law. The law had four main goals: coordinating environmental protection, preventing pollution, promoting polluter responsibility, and strengthening environmental management. It also required the creation of regulatory agencies and the rigorous observance of national and local standards for environmental quality and protection. These regulatory agencies included the Discharge Permit System (DPS), Deadline Requirements for Pollution Control, and the Environmental Impact Assessments (EIAs).<sup>4</sup> The DPS requires all companies to register with their local Environmental Protection Boards (EPBs). These EPBs are responsible for issuing permits to enterprises concerning waste discharge standards. Fines or closure face any violator of environmental statutes.

Each of these regulatory agencies has regional branches that monitor the activities of local enterprises. Although legislation was written by the highest level of Chinese governance, it was the responsibility of regional agency offices to actually enforce the environmental regulations. Subsequent measures to prevent the release of emissions and pollution sought a centralized enforcement mechanism with moderate success.

### **B. Policy and Implementation**

As mentioned previously, the Chinese government has recognized the gravity of environmental damage and begun penning further ecological protection legislation. As the country's economic progress came at the expense of its environmental health.. Legislators continued to pen a number of laws stipulating new measures for environmental protection. Environmental protection legislation and economic policies have since been engaged in a tense, dynamic relationship that governs the shape of China's future.

The well-articulated, comprehensive environmental legislation for China has been in place over the past several decades. Why then has China failed in environmental protection? Has the government been unable or unwilling to chart a new environmental course that could go hand-in-hand with economic growth?

### **Environmental Policy**

China's environmental laws and regulations currently in place clearly reflect the central government's good intentions for environmental protection. However, these efforts extend only as far as the central government wishes. A latecomer to the developing world, China has argued that the main responsibility of emission reduction and environmental protection falls primarily on developed nations with greater technological abilities. This argument reflects the popular developing-country perspective that before any attempt to acquire and use advanced, clean technologies, the emerging economy must first progress through a period of pollution-intensive but cost-effective industrialization. Official government policy in the era of China's breakneck growth conforms to this growth at all costs perspective.<sup>5</sup>

Coming to the late 1990s as China began to experience a series of environmental disasters along with rising social unrest, Hu Jintao's government started to launch more environmental protection measures as far as the central authority could reach. The government devised a variety of methods to improve efficiency in implementing environmental laws. While encouraging the enterprises to proactively lower emissions, the government has simultaneously resorted to a punitive fiscal policy for the firms producing excessive emissions. For instance, the government taxes the use of coal with high sulfur content at a higher rate. The progressive tax system is to encourage enterprises to use more sustainable energy resources. Enterprises equipped with treatment facilities for emissions and waste products are offered tax breaks and subsidies. Official attempts have also been made to establish a system of emissions trading but it still remains at an experimental stage.

The provisions of the eleventh Five-Year Plan stipulate the responsibility of the government to promote the use of sustainable energy resources, such as hydropower, solar power, wind power, natural gas, biomass fuel and methane. Stipulated goals under the plan include the addition of approximately 3,000 megawatts of hydropower each year.<sup>6</sup> Wind power is also being explored. Most wind farms are to be located along the coasts and in the northern and western regions. These farms can produce energy that will be used in local villages and will later be integrated to grid-type power structures.

Solar energy production has remained on a relatively small-scale, powering individual homes and other small enterprises. China is the world's largest producer of solar energy cells, but the majority of them are exported. The largest form of sustainable energy will likely remain hydropower. The completion of the 18.2-gigawatt-producing Three Gorges Dam will yield significant amounts of electricity, but at the great costs of flooding and pollution resulting from the dam construction. Despite these advances made in sustainable energy development, it is well to note that the coal sector continues to account for a largest percentage of energy resources and consequent pollution in China.

President Hu justified the commissioning of massive projects such as Three Gorges Dam by proclaiming a new era of sustainable development known as "Green GDPism". This proclamation is considered a turning point in China's official policy on environmental protection. The statistical evidence does reveal that the total released volume into the atmosphere of chemical gases such as Sulfur Dioxide (SO<sub>2</sub>) and other noxious discharges decreases beginning in 2004-2005 when the release of these pollutants reached peaked, forming a turning point of gas release (Figure 6). The annual discharge of water pollutant Chemical Oxygen Demand (COD) is also shown to begin to fall from 2004 onward (Figure 8).<sup>7</sup> The government's latest efforts to raise air and water quality, although somewhat limited, must not be overlooked for this turn-around. It remains premature to tell whether these observed improvements will be sustainable over a long-term period. Also the overall level of emissions has yet to show significant signs of lowering.

Most importantly, however, there is no evidence of any decline in the country's emission of the greenhouse gas, Carbon Dioxide (CO<sub>2</sub>). Green gas is widely acknowledged as the main culprit for global warming. On the contrary, China has now surpassed the United States in green gas release on a rising trend (Figure 11). If the Chinese economy is able to gradually shift to a nonresource-intensive, clean technology-based development path, the emissions of these pollutants could subside in future.

### **Implementation Challenges**

Hu's governmental efforts to resuscitate the environment has, however, been facing insurmountable obstacles. First, one needs to understand China's political structure, culture and institutions that may well undermine the efforts by the central authority in Beijing. Although Chinese environmental protection legislation is relatively thorough, it has been very poorly implemented. There are huge obstacles in implementing the official policy. First of all, the current mechanisms in place to enforce environmental protection are highly inadequate and ineffective to resolving continuing tensions among the central government, local authorities, polluters and pollution victims (Wang, 2007).

The major obstacle to policy implementation is the country's multifaceted corruption system. Corruption in China is a result of both greed and the central government's lack of clarity and uniformity. Because the central government has cited both economic growth and environmental protection in legislation, enterprises and government power plants are faced with altering methods of production while simultaneously continuing to increase output.<sup>8</sup> Such a transition is clearly difficult and should be implemented in an iterative fashion rather than all at once. However, since legislation stipulates strict requirements for both financial growth and emission reduction, local authorities are forced to partially enforce national laws citing quotas in both fields. Since meeting or exceeding economic growth goals rewards officials a considerable financial bonus, all choose to meet economic growth goals rather than begin instituting cleaner, slightly less efficient technology.

Owners and operators of coal-burning plants and other enterprises alike also receive financial bonuses for meeting or exceeding power output quotas. Therefore, before government officials arrive to inspect emission output, plant workers frequently decrease power output in order to meet pollution standards. With decreased power output comes decreased emissions release. After inspectors depart the plant satisfied, owners will return settings for maximum power output and the corresponding level of pollution that typically violates the law. In other instances, inspectors receive money for operating efficient sectors and conduct bogus inspections. No reward is offered for curbing emissions. Bribery between inspectors and plant owners is very common. These power plants are vital to rural township economies. If they were to close due to either excessive pollution or insufficient energy production, workers would be without pay or employment. Therefore, plant workers, plant owners, inspectors, and regional overseers alike all find it advantageous to allow excessive pollution.

Within the plants, the equipment and processes necessary to filter and capture pollutants are also costly. Factory owners allow pollution to continue to keep costs of production low. Bribery is also a systemic issue. Inspectors frequently receive bribes from polluting manufacturers to allow their businesses to continue. In some cases, such as Township and Village Coalmines (TVCM), bribes are distributed to allow power plants and other facilities to simply be granted operational approval. Chinese coalmines are



owned by either the central or state government. In the early days of the People's Republic of China, TVCM supplied coal to the rural areas for power generation. When environmental protection was launched, most TVCM sites were deemed both unsafe and excessively polluting. The central government set cleanliness standards that few TVCMs could meet. Many of those unable to satisfy the government's emissions standards continue to operate illegally to this day. Because they embody a significant source of income and employment, few regions can afford to lose TVCMs so local officials ignore them. The coal from TVCMs is of very poor quality, generating pollution exceeding the government-approved level.<sup>9</sup> China's GDP per unit of energy consumed has been substantially low compared to other nations (Figure 7). Local administrators and workers find mutually beneficial to dodge environmental protection legislation and to increase more power output, employment, and income.

### **3. Policy Consequences**

Inattentive and poorly executed government policies resulted in the release of pollution, degrading the country's habitat in a multifaceted manifestation. The major air pollutants are sulfur dioxide, nitrogen oxides, and soot. All primarily result from coal combustion in power plants and individual homes along with the burning of fossil fuels (Figure 8). These chemicals react with water and oxygen in the atmosphere to form mild solutions of sulfuric and nitric acid. Winds spread these new compounds before they return to land as acid rain, which falls on over 30% of China's surface area.<sup>10</sup> A third of agricultural land in China is subject to acid rain, contaminating crops. This acid rain has a power of hydrogen slightly less than 4.5 in certain areas, which is a very acidic level (Figures 9 and 10).

China is currently home to 16 of the world's most polluted cities, and only one percent of 560 million urban dwellers breathe air that meets the EU standards. About two-thirds of Chinese cities fail to meet air quality standards set by the national government. These egregious conditions create a plethora of respiratory diseases, culminating in an estimated 75,155,000 asthma attacks and 400,000 premature deaths. Incidences of diarrheal diseases, cancer, tumors, leukemia, and stunted growth have all risen over the past 30 years. The pollution-caused incidence of cancer is 19% in urban areas and 23% for rural dwellers since 2005. The US Environmental Protection Agency estimates 25% of Los Angeles air pollution floats across the Pacific from China.

China's water pollution is also a devastating byproduct of acid rain. Some 70% of China's two major rivers, the Yangtze and Huang He, have been contaminated, resulting in the local extinction of many species. This has a crippling effect on rural dwellers, 75% of whom have no access to drinking water. In a survey of 44 cities, 42 had "serious" groundwater problems. 75% of city water is unfit for drinking and 30% of river water is unsuitable for fishing. Water categorized as being of the lowest quality now

represents a quarter of the Chinese water supply.<sup>11</sup> Rural dwellers who require drinking water, food, and income via fishing from rivers are hit hardest.

This devastating water pollution is also a result of illegal waste disposal practices. A majority of power plants dispose of all waste without any treatment.<sup>12</sup> Many coal-burning power plants dispose of waste by simply dumping into rivers or lakes. Droughts are also common because water is siphoned from rivers to irrigate distant agricultural projects that are destroyed by acid rain. Deforestation has also increased the flow of mud down the rivers, further polluting waters.<sup>3</sup> This mud combines with pollution from power plants to form massive concentrations of algae that contaminate river drinking water. Multiple sewage treatment plants have been erected solely to filter these giant floating clusters of algae.

China's climate has begun to change for the worst. Temperatures have risen by 0.5-0.8 degrees Celsius annually. Precipitation has decreased at an average rate of 2.9 MM/10a (millimeters per 10 annum) since the 1950s. This decrease has proven severest in the northern regions where the rate of the decline has reached an alarming 20-40 MM/10a. This sharp drop in precipitation has further depleted China's rivers that are the source of siphoned irrigation waters.<sup>13</sup> Droughts have struck much of the country during the summer months. The sea level along China's eastern border has risen an average of 2.5 MM/A (millimeters per annum), which surpasses the global average.<sup>14</sup>

China's massive population is also becoming a source of environmental degradation. In 2007, China surpassed the United States as the world's largest producer of greenhouse gases.<sup>15</sup> These gasses, such as carbon dioxide, result from the burning of fossil fuels and any form of combustion and are responsible for global warming. As China grows wealthier and more citizens are able to afford cars, carbon dioxide emissions will continue to rise steadily.<sup>16</sup> China now is the largest emitter of carbon dioxide in the world (Figure 11). Current estimates place the number of private cars in China over 30 million, with projected 110-160 million cars by 2020. China also currently has 50% of the world's motorcycles. Chinese cars do not meet the European Union's oldest emissions standards. Greenhouse gasses are hastening desertification across the Gobi Desert, which has steadily increased by 1900 square miles a year.<sup>17</sup> Over 25% of China's land area is a now desert, affecting over 400 million citizens in the Northwestern provinces.

## **4. Policy Actions Required**

### **Domestic Actions**

In China, the pollution has now reached such an egregiously excessive point. A recent estimate indicates that between 8 percent and 12 percent of its GDP is lost annually due to pollution.<sup>18</sup> To begin with, the Beijing government needs to articulate a new development strategy consistent and efficient in

resources use in meeting the dual goals of economic growth and environmental protection. Excessive and uncoordinated output targeting by the central authority for growth and environment simultaneously leaves local officials with little room or time for actions. Inspectors and overseers would face a choice. They can either dodge anti-pollution legislation and be rewarded for the production of energy. Alternatively, they can reduce both output and emission level and be reprimanded by the central authority. By setting a locally achievable growth target considered as compatible with local environmental requirements, the central authority could set feasible benchmarks at the local level.

For environmental protection, the government must usher in expansive reforms, particularly in implementation methods and procedure. The current authoritarian political system based on locally decentralized policy implementation has failed to alleviate communication, corruption, and guanxi (connections). In order for centralized plans for environment to come to fruition, the full force of the central authority in the case of China must be allowed to be exerted into actions by local authorities. The central leadership should be capable of managing all branches of the administration properly and of forcing regional and local governments to cooperate with the center. It is important to point out that in order to assure more effective policy implementation, centralized plans need to be based on a collectively agreed framework by regional authorities. In the case of China since the legislation required for environmental protection is already in place, upon effective implementation the severity of the degradation should decline in a gradual atrophy.

The central authority must also come up with more realistic and transparent guidelines and regulations to deal with the case of bribery, corruption and other forms of irregularities.<sup>19</sup> In this context, the leaders need to rely on market-friendly interventions as much as feasible. It could begin administering financial penalties for violation of the emission standards while providing financial compensation for compliance. In China today, when these punishments are allotted, they lack the severity necessary to send a message. The collection of penalty fees average only 30% of those actually owed for legislative violations.<sup>20</sup> Regional governors, inspection officials, and plant employees have deliberately disobeyed regulations, suffering a minor punishment, and receiving a reward for complying with the growth target. In this context, financial compensation or subsidy in return for emission reductions and green technology adoption could be considered.

The agencies charged with protecting the environment need better training for staff, reorganization and improved inter-agency coordination. Many inspectors are without sufficient education to properly enforce the laws. China's efforts to decentralize power and decision-making have backfired as a result of poor performance of inspectors. Most importantly, these inspectors must be clear of any conflicts of interest with other agencies or producing firms of energy. Their specific missions must also be explicitly stated and

distinguished from one another, because they typically have overlapping purposes and missions to accomplish. The Environment Supervision Bureau established in 2002 is the first centralized agency held accountable for implementing environmental regulations.

The Chinese court system is also in need of reorganization. Judges suffer from an alarming lack of education as well. Most are former soldiers who have been demobilized and never given formal instruction in the legal system. Some lack in education beyond secondary school. The problem is so pervasive that when expert witnesses are called, judges are typically unable to understand their testimony or its significance. Regional judges are also civil servants on the payroll of local governments, calling their bias into question. Because local governments frequently receive financial bonuses from profit-oriented firms, the judges side with local governments and tend to rule in favor of enterprises charged with pollution rather than the plaintiffs. Most of the cases that reach court tend to remain in dispute for over 10 years, which strongly discourages citizens from bringing a dispute to the court. When protracted trials do reach a decision, the courts may not follow up to enforce the decision. Frequently, the defendants fail to compensate plaintiffs for years. By removing the local judiciary branch from the local government's payroll system, the plaintiffs would be granted much better chance for a fair trial<sup>21</sup>.

The central government could set a modified new pricing system in order to encourage the use of sustainable energy resources. For instance, the energy derived from coal-fired power plants must be quoted at a higher price in relation to that of sustainable resources. All types of fuel should also be taxed according to the level of environmental degradation they could potentially cause. Leaded petrol should be subject to higher tax rates and potentially be phased out when conditions permit. Chinese cars should also be required to pass rigorous emissions tests and until then be priced higher to compensate for their pollution. Sustainable forms of transportation should be endorsed, rather than discouraged, by the government. Many cities have policies banning the use of bicycles, but these should be quickly and safely reversed. Road pricing that reflects the environmental cost of excessive car use should also be instituted. While intercity highways have begun charging tolls, the revenue generated does not nearly compensate for the massive carbon dioxide emissions.<sup>22</sup> China should reconsider expressing economic progress in Green GDP. By subtracting from the nominal GDP the costs of environmental damage and natural resources depletion, it could reflect the real financial effects of the degradation that have gone unnoticed.

The central government could also encourage the citizens to share responsibilities protecting their own environment. The government pervasively controls NGOs, preventing them from engaging in grass-roots activities promoting environment protection. Chinese citizens should also be allowed to enjoy more legal and judicial freedom. They are left with little chance of winning a court case. Most of them are not even aware of the citizens' rights to prosecute a violating enterprise. The citizens should be encouraged to seek

reparations from polluting enterprises. Education on environmental protection would prove beneficial for inspectors, citizens, power plant workers, plant owners, and judges. Many entrepreneurs do not pollute intentionally but are simply oblivious of the basic conservation principles. Rural dwellers dump sewage and waste products into rivers and lakes, causing a host of environmental disasters (Figure 12). While many domestic problems hinder government efforts to protect the environment, the international arena reflects more room for improvement.

### **Global Actions**

China's failure with its own environmental problems has aggravated other nations' environment and will continue to do so unless China can turn the situation around. Acid rain and air pollution in particular have expanded gradually throughout the Chinese countryside and will soon bring devastating consequences to other nations (Figures 13 and 14). China, while prioritizing to mend its own fence, should thus make whatever efforts are possible to cooperate with the international community. Hu Jintao already assured of China's efforts to reduce emissions of pollutants. At the same time, he reminded the already-industrialized West of responsibilities to share the primary burden of global environmental protection. Clearly, given that China's insolvency on its environmental problems will have devastating effects on the global economy. The West should cooperate with China in building capacity, sharing information on environmental management and by sharing access to green technology.

China and Japan already agreed to work together on issues related to global warming under the U.N. Framework Convention on Climate Change.<sup>23</sup> Both nations will make an effort to promote the post-Kyoto Protocol agreement. China and the United States, as the two largest consumers of energy in the world, have an ongoing dialogue on energy policy annually since June 2005. China, as a heavy investor in ASEAN business ventures, has shown an interest for a joint agreement on energy and pollution issues.<sup>24</sup>

## **5. Concluding Remark**

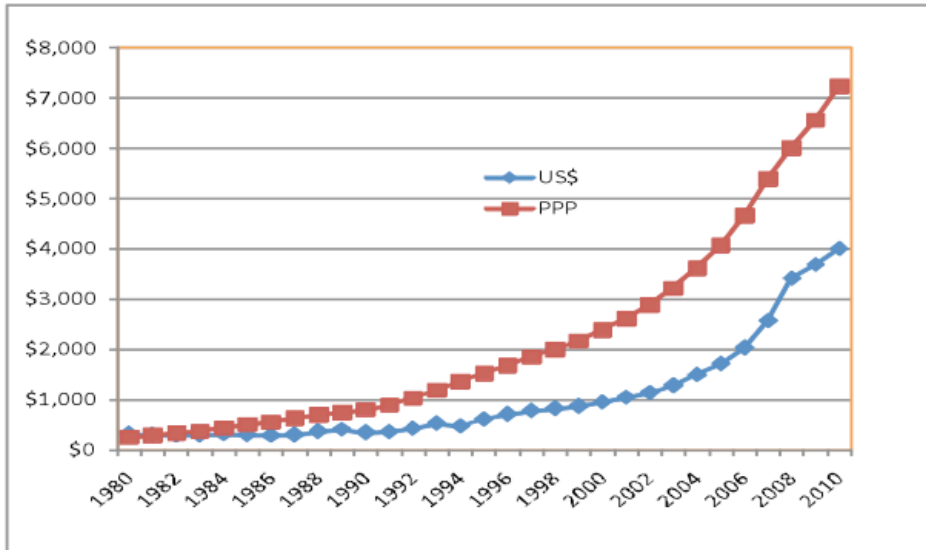
China's robust growth over the past four decades gave rise to disastrous consequences on the country's environmental conditions, putting its people much at risk in health and quality of life. The Chinese government's preoccupation with growth and its systemic failure in environment protection have led to the ecological problems of every kind. Critics of the Chinese model even suspect that China may have already reached a point of no return where environmentally sustainable development becomes irreversible. Moreover, it must be noted that China's recent policies have largely been aimed at reducing local pollution, and certainly not at curbing green gas emissions for the benefit of the world.

In response to the mounting domestic protests, social unrest, and international pressures, the Chinese government only recently became more seriously concerned with protecting the environment. Many barriers exist that prevents the government from adequately addressing the issues on environment and growth simultaneously. These include global uncertainty, rigidity and inefficiency in governance, bureaucratic corruptions and rent-seeking activities, technical challenges, and economic realities. Without much bolder and improved policy implementation in place and in the absence of effective global cooperation, it does not appear the government's current efforts will be enough to assure a sustainable development in the foreseeable future.

## **Endnotes**

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- <sup>3</sup> MacBean, Alasdair (2007), "China's Environment: Problems and Policies." *The World Economy*. Oxford University Press: p.298.
- <sup>4</sup> MacBean, Alasdair (2007), op. cit. p.299.
- <sup>5</sup> Jin, Bei (2009). "The Relationship between Resource and Environmental Regulation and Industrial Competitiveness." *China Economist*. 2009. p.39.
- <sup>6</sup> Chow, George C. (2007), "China's Energy and Environmental Problems and Policies." *Econometric Research Program*. p.11.
- <sup>7</sup> The amount of oxygen required when chemical oxidants are used to oxidize organic pollutants in water. A higher value reflects more serious pollution by organic pollutants.
- <sup>8</sup> MacBean, Alasdair (2007), op. cit. p.293.
- <sup>9</sup> Reyes, Esteli (2007). "Challenges for Effective Policy Implementation toward a Sustainable Coal Sector in China." Vancouver, B.C.: Esteli Reyes, 2007. p.15.
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- <sup>15</sup> Chow, George C (2007), op. cit. p.5.
- <sup>16</sup> MacBean, Alasdair (2007), op. cit. p.304.
- <sup>17</sup> MacBean, Alasdair (2007), op. cit. p.297.
- <sup>18</sup> Economy, Elizabeth C (2007), "The Great Leap Backward?", *Foreign Affairs*, 86(5),46.
- <sup>19</sup> Bei, Jin (2009), op. cit. p.43.
- <sup>20</sup> MacBean, Alasdair (2007), op. cit. p.301.
- <sup>21</sup> Wang, Canfa. (2007), op. cit. p.174.
- <sup>22</sup> MacBean, Alasdair (2007), op. cit. p.304
- <sup>23</sup> Kim, Yoon Jung, and Dongchao Li. (2008), op. cit. p.25.
- <sup>24</sup> Yoshida, Takashi. (2010) "Environmental Pollution Control: Advantage or Disadvantage for Latecomer's Economies in East Asia?" *PRI Discussion Paper Series*. Hiroyuki Taguchi. A ed. Vol. 10. Tokyo, Japan: Research Department Policy Institute, MOF. 15-16. Ser. 2. p.10.

## Appendix



Source: The World Bank, WDI Database.

Figure 1. China's Per Capita GDP in PPP



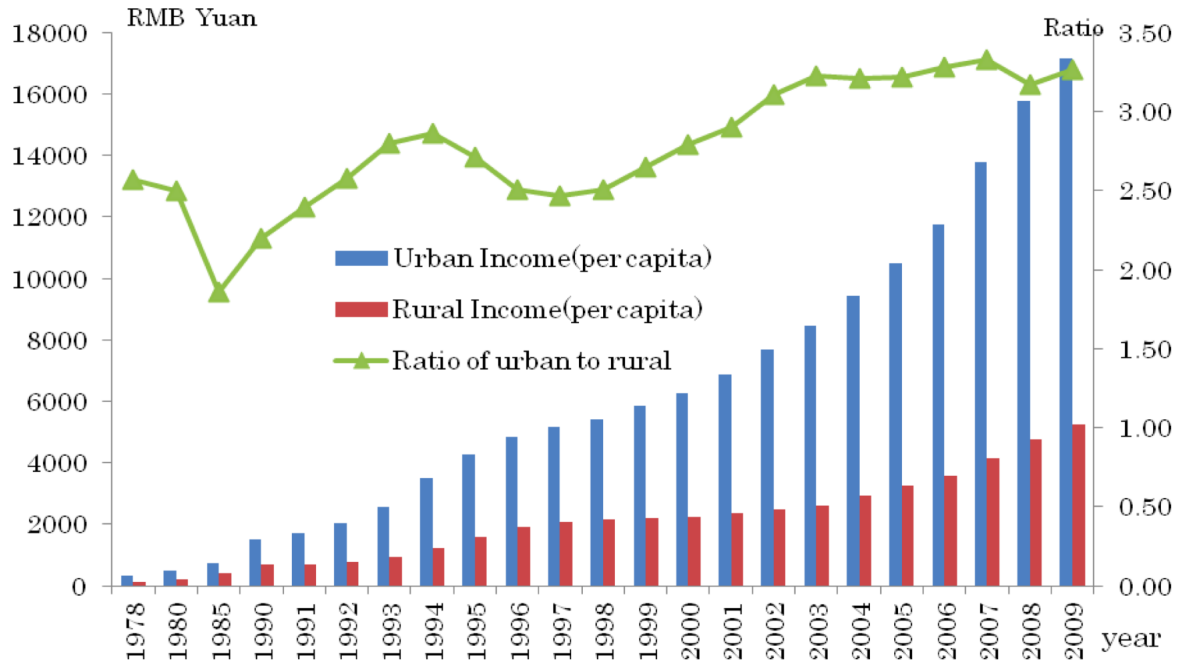


Figure 2. Income Inequality in China ,1974-2009.

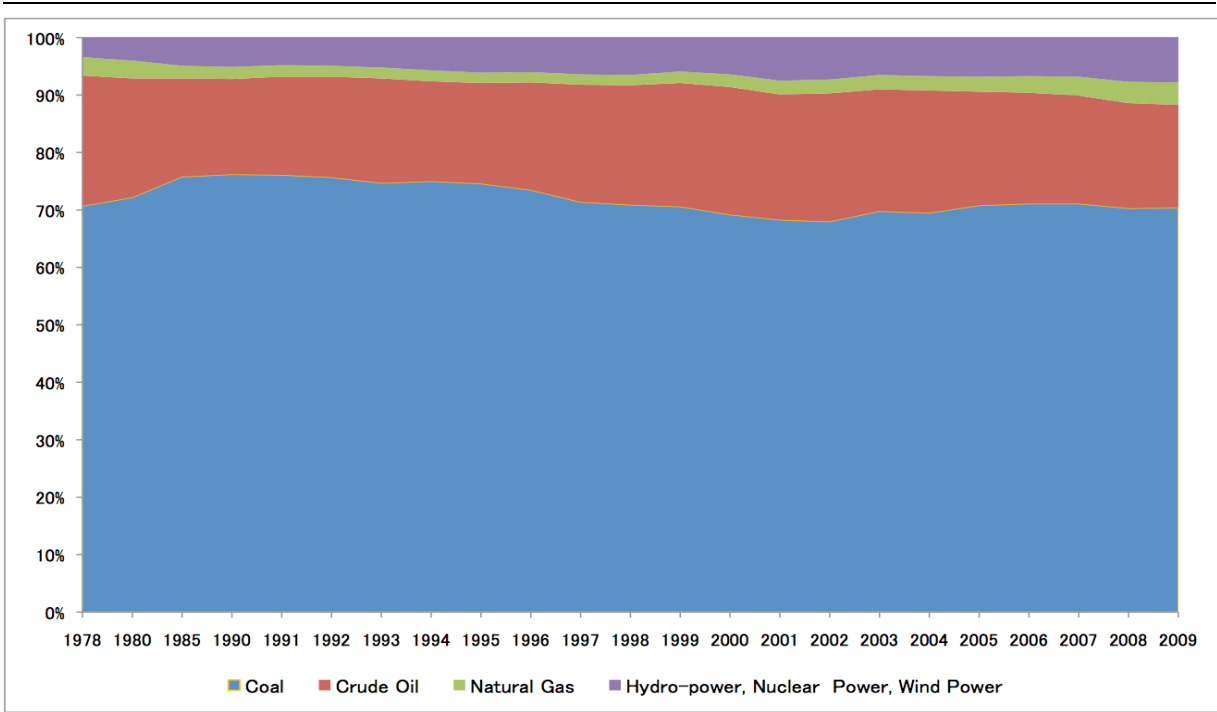


Figure 3. Composition of Energy Use In China

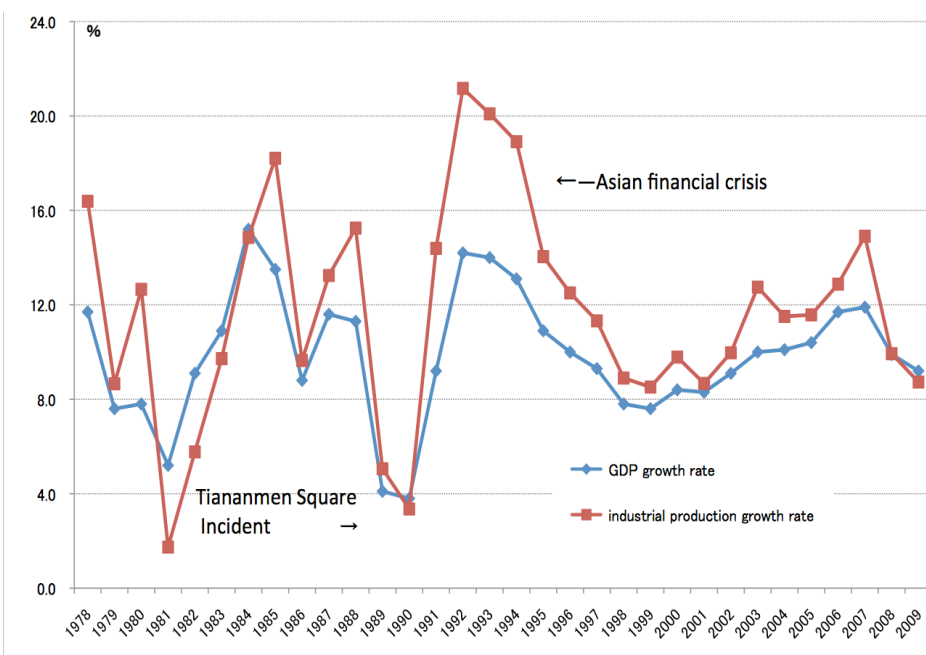


Figure 4. China's GDP and Industrial Output Growth Rates

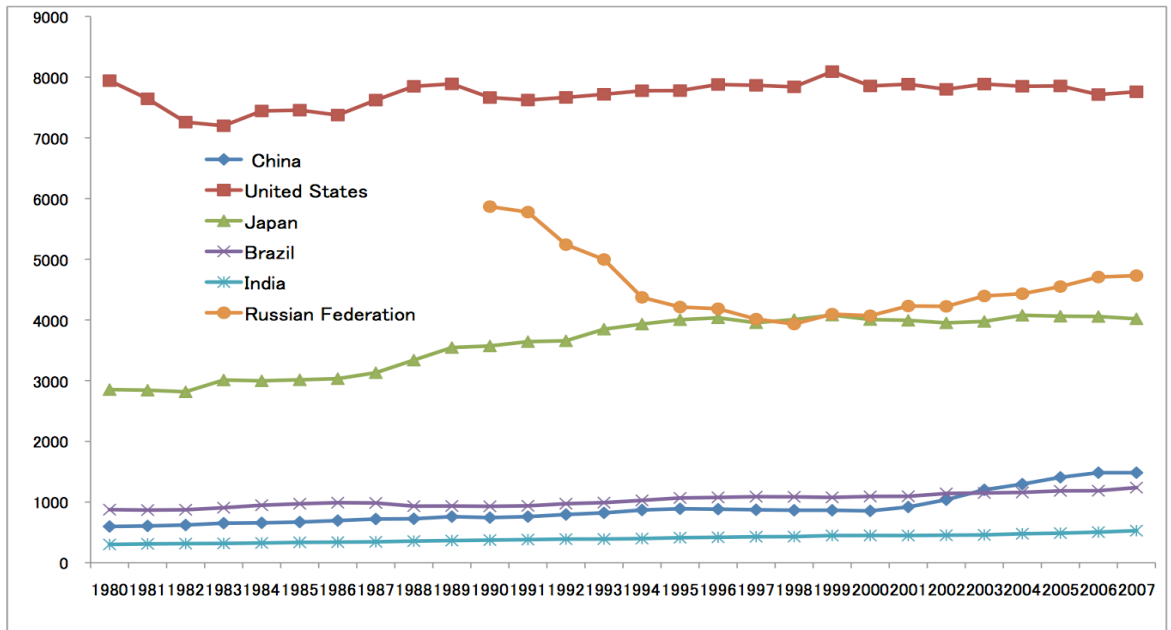


Figure 5. Energy Use (Kilograms Of Oil Equivalent Per Capita)

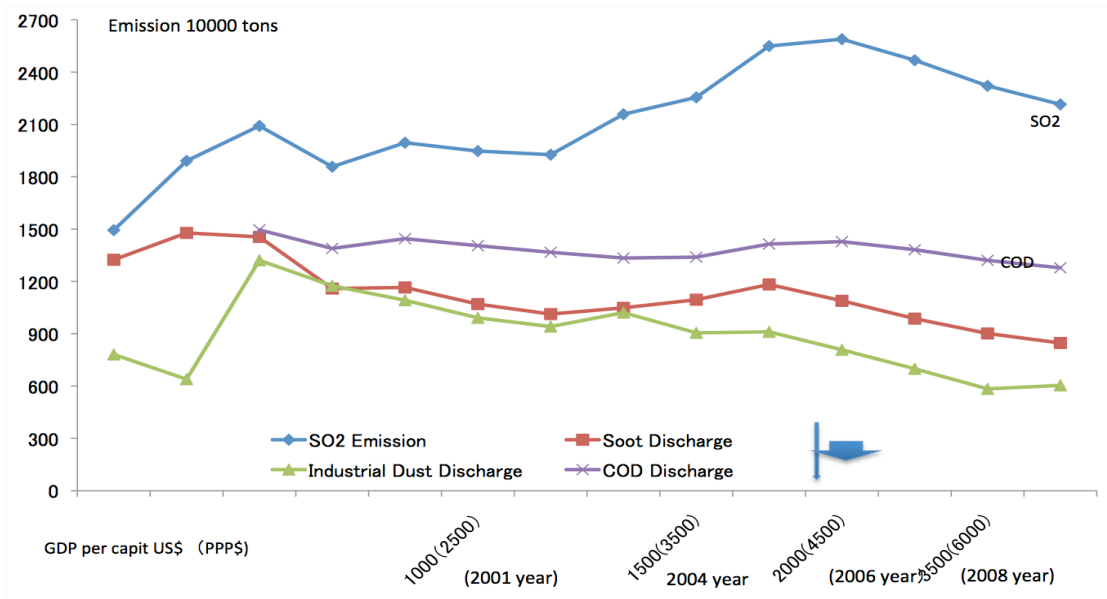


Figure 6. Turning Point During the “Green” Period (Which the Arrow Indicates)

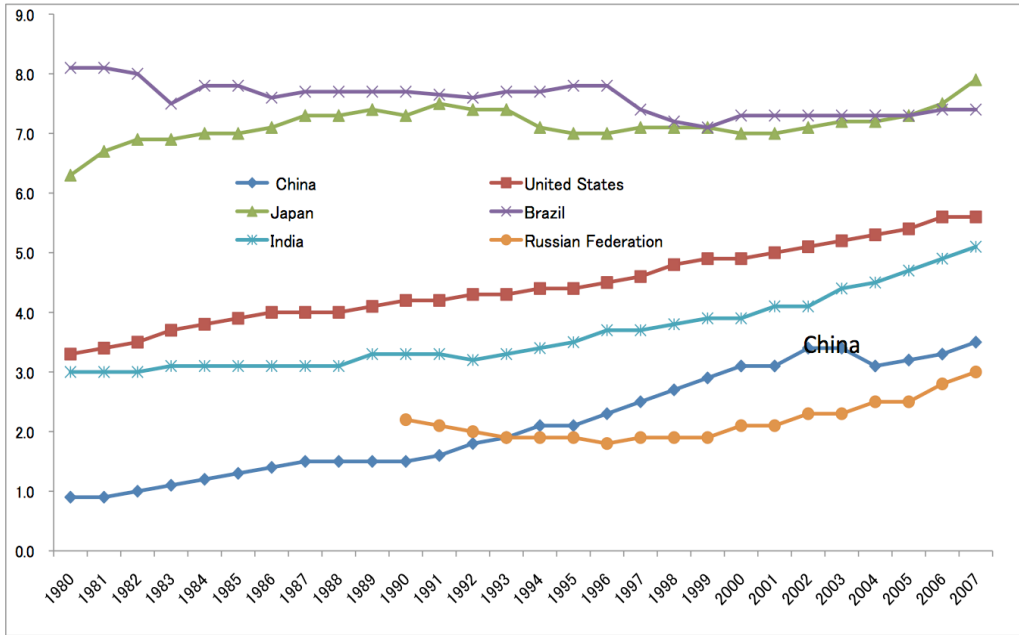


Figure 7. GDP Per Unit of Energy Use

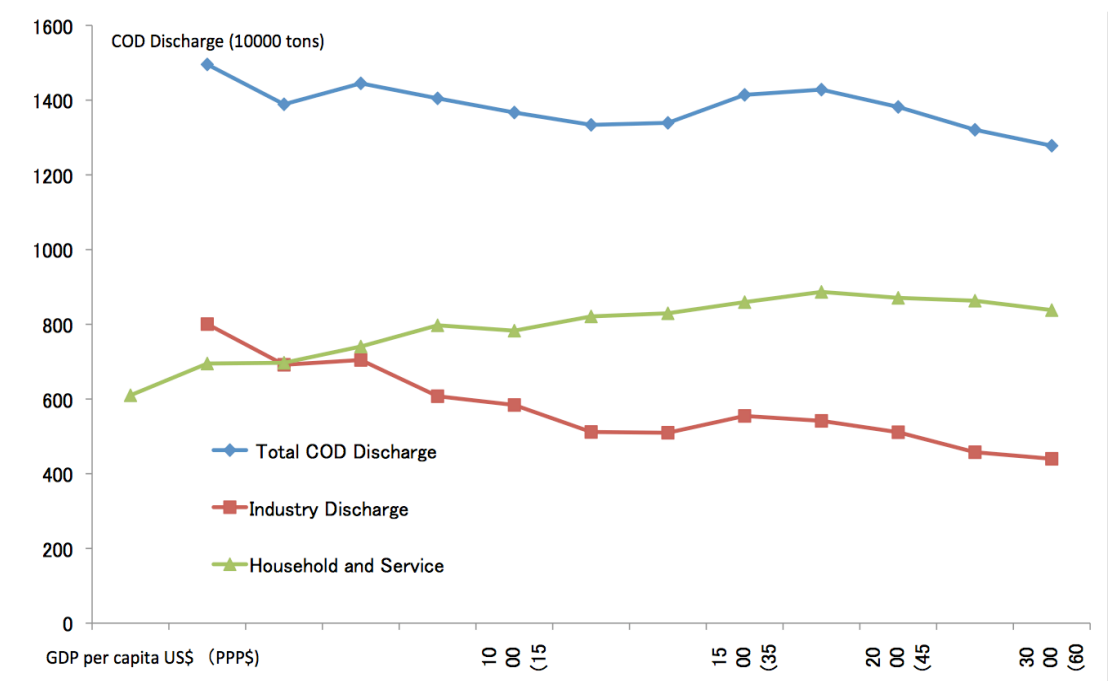


Figure 8. COD Emissions Per Year

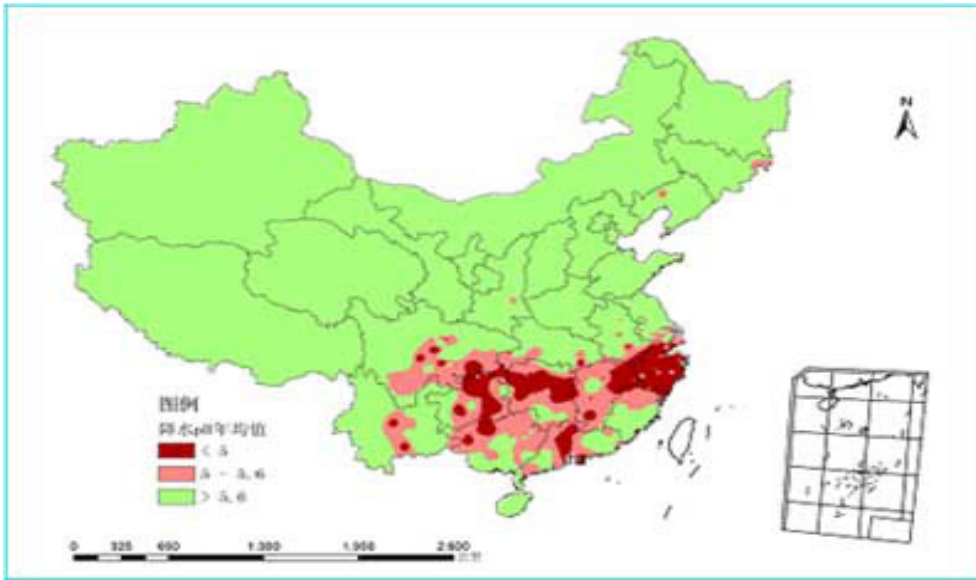


Figure 9. Acid Rain Distribution by Regions and Acidity in 2002



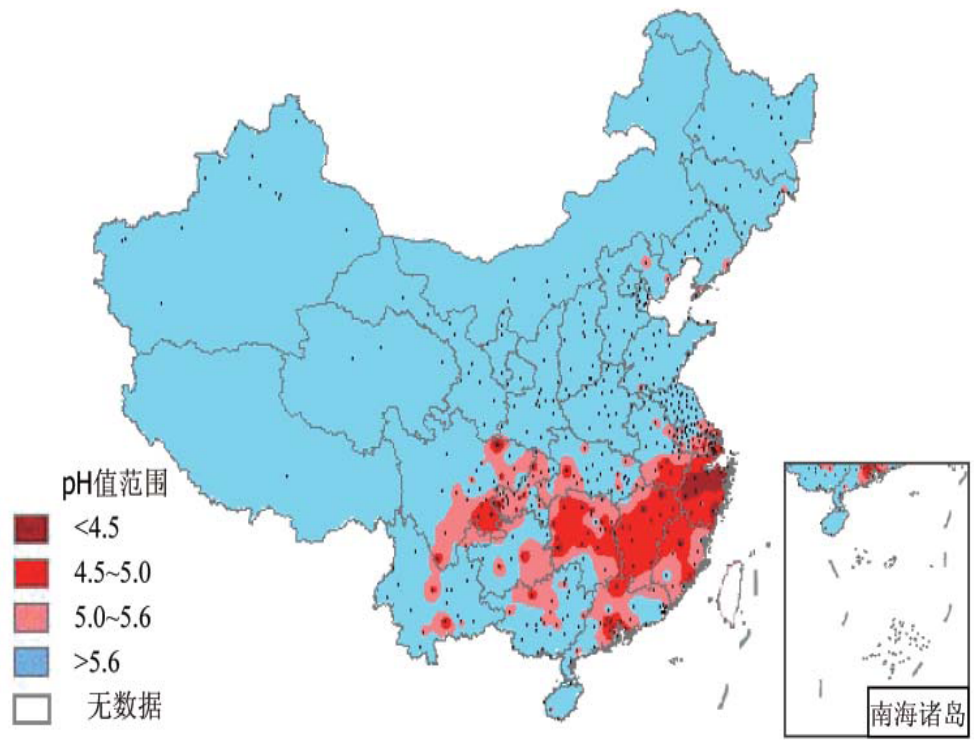


Figure 10.. Acid Rain Distribution by Region and Acidity in 2008

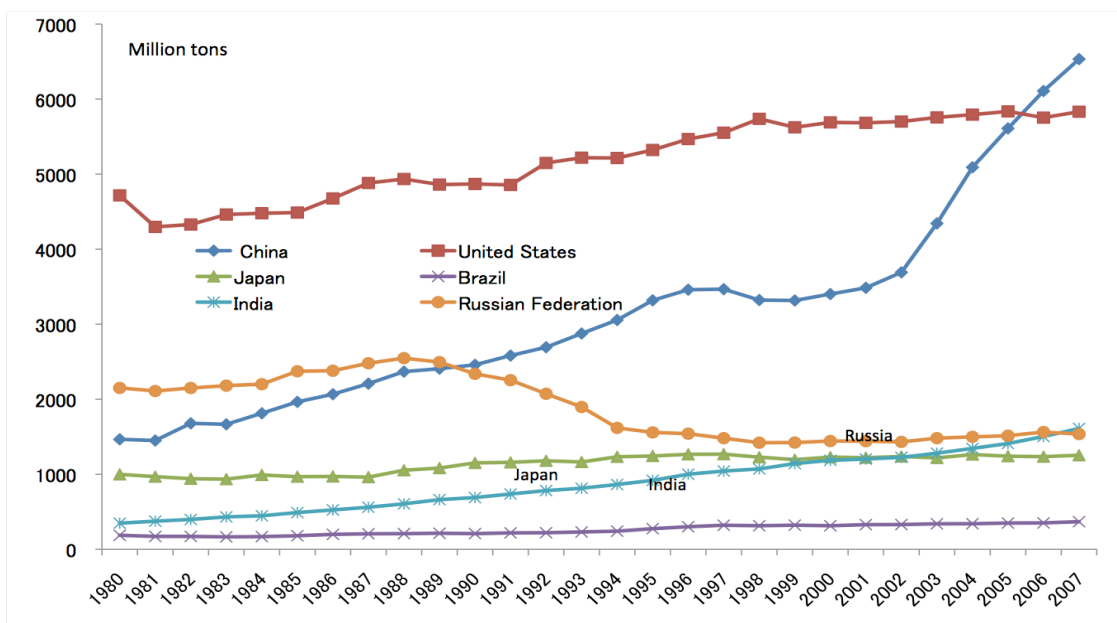


Figure 11. Comparison of Carbon Dioxide Emissions

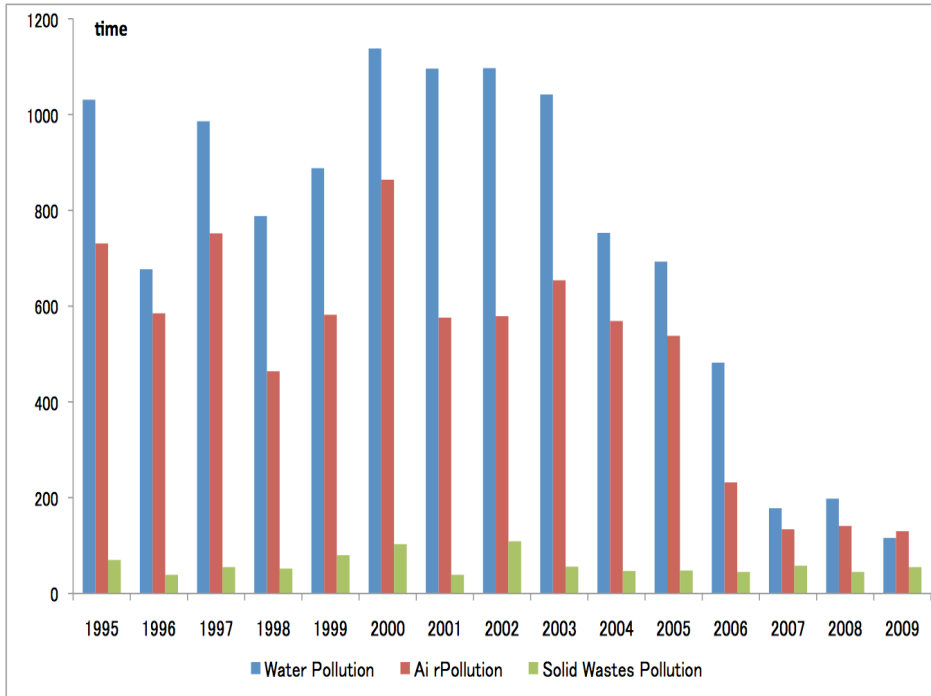


Figure 12. Environmental Accidents in China

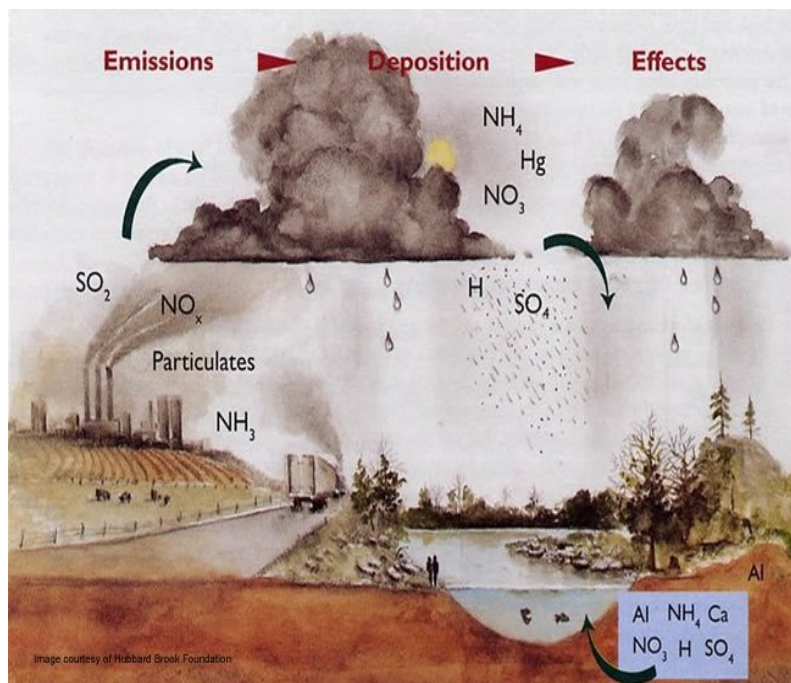


Figure 13. Acid Rain Cycle

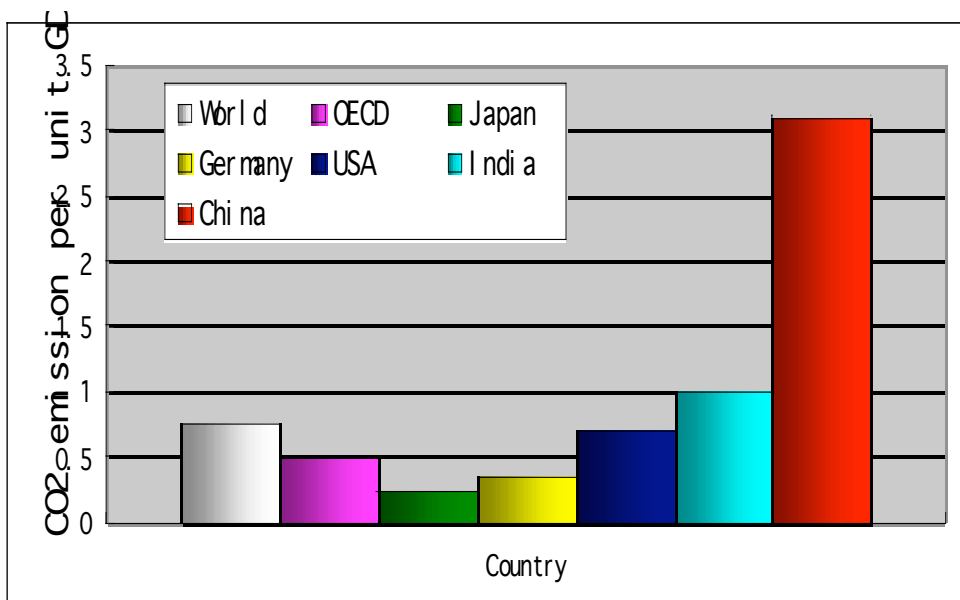


Figure 14. Carbon Dioxide Emissions Per Unit GDP By Country

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