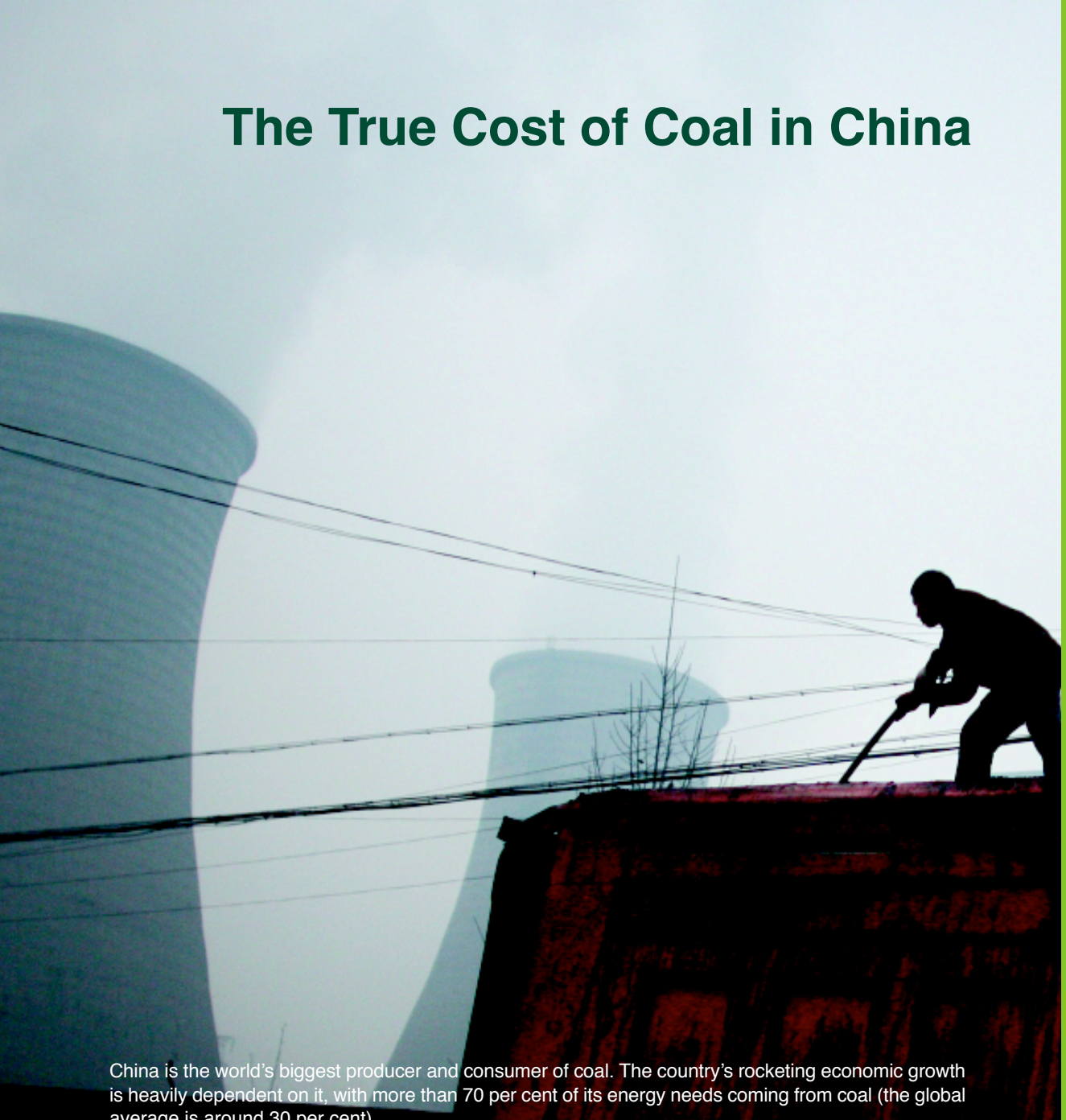
The True Cost of Coal in China



China is the world's biggest producer and consumer of coal. The country's rocketing economic growth is heavily dependent on it, with more than 70 per cent of its energy needs coming from coal (the global average is around 30 per cent).

However, this reliance on coal comes with heavy environmental and social costs. Every step in the process of using coal, from mining through to combustion, is wreaking severe damage to China's environment. Of most concern is climate change, primarily caused by burning fossil fuels such as coal.

The True Cost of Coal Report was commissioned by Greenpeace, the Energy Foundation and WWF and written by the Unirule Institute of Economics, the Energy Research Institute of the National Development and Reform Commission (NDRC), the Energy Research Institute of Shanxi Academy of Social Sciences, the School of Public Health at Peking University, and the National Centre for Disease Control and Prevention.

The report estimates the external costs to China of using coal. The term "external" incorporates air and water pollution, ecosystem degradation, damage to infrastructure, human injuries and loss of life, and takes into account the distortion of government regulations.

The key finding of this report is that in 2007 alone, on average, each tonne of coal used in China caused environmental damages of RMB 150. The total external costs of coal use in 2007 reached RMB 1.7 trillion, equal to 7.1 per cent of China's 2007 GDP.

To ensure its energy security, environmental protection and healthy economic and societal development, China must reduce its reliance on coal. To achieve this aim, China must introduce an appropriate coal-pricing mechanism and instigate an energy revolution to radically improve energy efficiency and put heavy emphasis on expanding the renewable energy sector.

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China and coal

Over half of the coal burned in China is used for power generation, with the steel, construction and chemical industries accounting for another 17 per cent, 16 per cent and 5 per cent respectively. The remainder is burnt in people's homes. Coal-fired power stations are China's biggest source of air pollution and the world's biggest emitters of greenhouse gases. The extraction, processing, transportation and combustion of coal produces wastewater, airborne pollution and solid waste, and also contributes to climate change. Currently, none of these costs are fully reflected in the price of coal.

Environmental impacts of coal

Climate change

Climate change is the single greatest threat to human life on Earth. Coal is responsible for 80 per cent of China's annual carbon dioxide emissions, the most common greenhouse gas.

Climate change has serious impacts on industry, society, health, water resources, agriculture and ecosystems. Climate change also threatens China's food security. According to recent scientific data, rising temperatures, loss of arable land and water scarcity may cut China's overall food production by up to 23 percent by 2050[1].

According to the Intergovernmental Panel on Climate Change, if the current rate of warming continues unabated, more than 80 per cent of glaciers in the Himalaya will disappear completely within the next 30 years. In the course of this century, more than one sixth of the world's population will be facing water shortages.

The frequency and intensity of extreme weather events caused by climate change are projected to increase significantly. Storms, droughts, typhoons and flash floods will exact a heavy toll in terms of human and economic losses. Every year extreme weather events damage approximately 50 million hectares of agricultural land, leading to an average annual loss of 43 million tonnes of crops. Annually, 400 million people in China are affected by extreme weather, with average annual losses totaling RMB 200 billion[2].

Air pollution

Burning coal is the biggest source of air pollution in China. Coal contributes to 85 per cent of China's sulfur dioxide (SO_2) emissions, 67 per cent of its nitrogen oxides (NO_x) emissions and 70 per cent of particulate matter (PM).

Chronic respiratory diseases, linked to air pollution, have become one of the leading causes of death in China. Without significant action, by 2020, air pollution could cost China US$390 billion per year as a result of disease, illness and premature death[3].

Water shortage and wastewater

Coal mining and extraction are water-intensive practices. For each tonne of coal produced, 2.5 tonnes of water is polluted. It lowers the water table, leading to ecosystem degradation, land slumping and land erosion. Of the 96 major state-owned coal mines, 71 per cent face water shortages, and 40 per cent are seriously short of water.

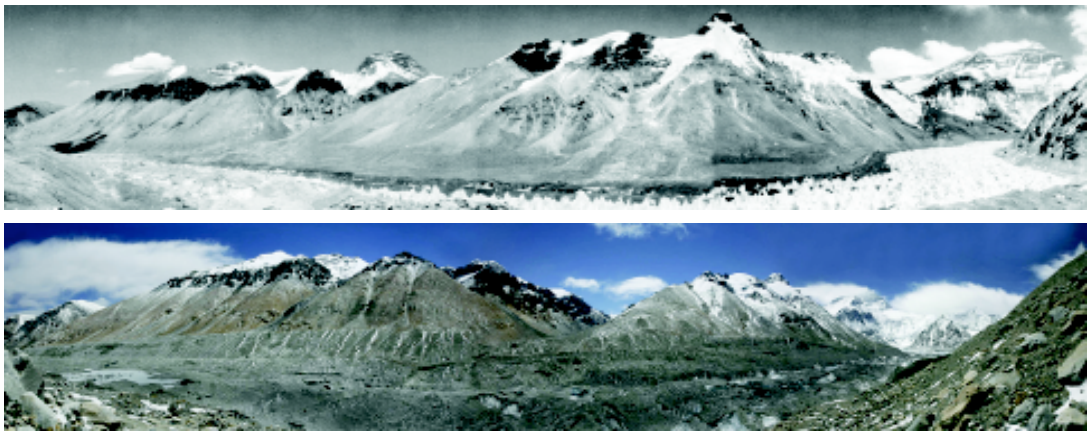
Wastewater from washing coal, which accounts for 25 per cent of all wastewater in China, carries a large amount of slime, mud, sediment and harmful heavy metals[4].

Soil pollution and land degradation

Mercury, a toxic coal contaminant, causes serious pollution to soil. Each year, 12 million tonnes of food supplies are polluted by heavy metals such as mercury at a cost of RMB 20 billion.

Coal mining causes land subsidence and landslides, damaging roads, railways, bridges and electricity lines in coal mining areas. By December 2006, some 700,000 hectares of land subsidence had been caused by coal mines, costing a total of RMB 50 billion in damages.

Over 30 per cent of the land in China is affected by acid rain. In addition, by 2007, China's coal industry had left behind 3.6 gigatonnes of coal tailings or gangue, accounting for 40 per cent of solid waste in the country.



Original photograph taken in 1968 of the Rongbuk Glacier, Mt. Everest, compared with the receding glacier in 2007.

"Climate change has already brought severe and obvious threats to the economic and social development of China, and these threats will worsen in the future."

Dr. Qin Dahe, Academician of the Chinese Academy of Sciences, Chair of IPCC Working Group I

"China is a big energy producer and consumer, and most of our energy is derived from coal. China must take on the responsibility to reduce pollution and emissions."

Wen Jiabao, Prime Minister of the People's Republic of China

Report Findings and Recommendations

To avoid the serious effects of coal use, China must move away from using coal as its primary source of energy. To do this, a price signal for coal must be introduced. Correcting the coal price is a process of internalizing the external costs or impacts and, in doing so, providing incentives to reduce or remove them. The first challenge is to quantify the many external costs in order to lay the foundation for changing the price system.

To calculate the true costs of coal, all the economic, environmental and social costs (called external costs) of coal extraction and use were calculated and added to the market coal price. The report clearly demonstrates that the coal externalities are markedly more expensive than its market price. It makes economic sense for the government to adjust the coal pricing system to reflect its true costs. This would create incentives to developing cleaner, sustainable energy sources.

Using economic models, the report estimates the external costs of coal associated with air and water pollution, ecosystems degradation, infrastructure damages, safety and loss of life, and distortion from government regulations. It concludes that, in 2007, every tonne of coal used led to environmental damages of RMB 150. For all of the coal used in China in 2007, the total external costs reached RMB 1.7 trillion, equal to 7.1 per cent of China's GDP for the same year.

As research on the economic impacts of climate change in China is only a relatively recent area of study, it is currently difficult to estimate the loss in monetary terms. However, there is no doubt that if we took into account climate change impacts, the external costs of coal would be significantly higher.

Policy recommendations - Reforming the coal pricing system

Based on quantified external costs and the impacts of internalization, *The True Cost of Coal* Report points out that, to ensure that the true costs of coal are reflected in its price, China has to reform its coal pricing system. The internalization measures include imposing energy and environmental taxes, improving coal resource compensation systems, deepening market-oriented reform of coal and improving liability rules.

Calculation of External Costs of Coal from *The True Cost of Coal* Report

Environmental damages and distortion from regulations (2005)		External costs (yuan/tonne)
Environmental costs of coal mining	Loss due to water shortage and wastewater	26
	Loss from land subsidence	4.67
	Loss in buildings and transport infrastructure	1
	Land erosion and loss of ecosystems	25.8
	Coal gangue storage and treatment	4.9
	Air pollution from coal mining	7.1
Subtotal		**69.47**
Environmental costs of coal combustion	Health	44.8
	Agriculture	25.7
	Industry, transportation, materials, buildings and infrastructure	6.8
	Water quality	12.7
	Pollution of heavy metal to soil	1.2
	Solid waste of coal burning and electricity generation	0.5
Subtotal		**91.7**
Environmental costs of coal transportation	Noise, waste gas, etc	34.05
Subtotal		**34.05**
Distortion costs from government regulations	Electricity price influence on coal price	65
	Lack of safety investment	71.03
	Under-compensation for deceased miners	14.53
	Low cost of land	11.2
	Low price of coal resources	54.64
	High social burden of coal enterprises	-7
	External cost of overloading in coal transportation	16.25
	Railway Construction Fund	-7
Subtotal		**218.65**
In total		**413.87**

1 Chinese Academy of Agricultural Sciences, Greenpeace, *Climate Change and Food Security in China*, October 2008. http://www.greenpeace.org/china/en/news/climate-change-food-security

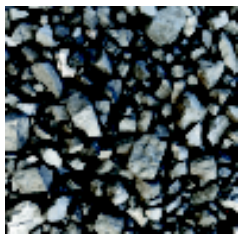
2 *China's National Assessment Report on Climate Change*, 2007.

3 World Bank, *Clear Water, Blue Skies*, 1997.

4 Liu Caiyin, *Theory and Practice of Cost and Price of Coal for Sustainable Development*, Collection of Thesis from 2004 High Level Forum.

"If we don't act, the overall costs and risks of climate change will be equivalent to losing at least 5 per cent of global GDP each year, now and forever. If a wider range of risks and impacts is taken into account, the estimates of damages could rise to 20 per cent of GDP or more."

Stern Review: The Economics of Climate Change



Environmental tax (SO_2 tax)

Taxation Purposes: To internalize the external cost of sulfur dioxide emissions

Taxation Objects: Enterprises (mainly power plants) using coal as the primary industrial fuel

Tax Base: Sulfur dioxide emitted by large and medium-sized power plants; coal purchased for small coal burning power plants with emissions that are difficult to detect

Tax rate: 9 per cent of coal price

Tax Usage: Tax on sulfur dioxide should be earmarked for the government installation of sulfur dioxide emissions monitoring system, as compensation for damage caused by sulfur dioxide, and for subsidies to enterprises that reduce sulfur dioxide emissions significantly

Energy tax

Taxation purpose: To reduce energy consumption, increase energy saving and efficiency, improve the energy structure and reduce the effect of greenhouse gases and other pollutants

Taxation Objects: Coal, petroleum and natural gas

Taxable Areas: Coal mines, other energy exploitation enterprises

Tax Base: Depending on the quantity

Tax Rate: Could be increased gradually. Considering the bearing capacity of enterprises and social acceptability, a low tax rate could be a good start, such as 30 RMB/tonne for standard coal. The tax rate could be increased to a higher level later.

Payment Date:

*** method 1:** pay taxes once a month and payment should be made 15 days after the end of the month

*** method 2:** pay taxes once each half year and payment should be made 15 days after the end of last half year.

Roadmap to internalize the external costs of coal

2009
- To increase the mine toll
- To levy SO_2 tax
- To determine the taxation plan for a carbon tax
- To abolish the coal-electricity tariff automatic mechanism
- To abolish the Railway Construction Fund

2010
- To levy an energy tax
- To establish a fair coal extraction entry system
- To amend the market price mechanism for land
- To improve railway transportation capacity for coal
- To clarify and implement liability rules for coal producition accidents, over loading and road accidents, and damage to surrounding water, air and landscape

2012
- To levy a carbon tax

2020-2030
- In 2020 and 2030, raise carbon tax rate further

Moving away from coal to a clean energy revolution

Faced with such serious environmental impacts and challenges, China needs a revolution in its energy sector. In an energy scenario for China conducted by Greenpeace, it found that, by 2050, an increase in energy efficiency would reduce China's energy demand by 40 per cent and renewable energy, including wind and solar, could satisfy over 50 per cent of China's electricity consumption.[5]

With an effective price signal for coal, a massive improvement in energy efficiency and large-scale implementation of renewable energy, China could meet its social and economic needs as well as avoid many of the worse impacts of coal use and climate change. This is the challenge and opportunity for the Government of China. Greenpeace calls on the Government to seize this opportunity and move the country away from coal for its own sake and as part of the global solution to climate change.

5 Greenpeace, *China Energy [r]evolution: A sustainable China energy outlook*, 2007.

GREENPEACE 绿色和平
Floor 19, Unit 2, Block E, Lanchou Famous Building, Jiqingli, Chaowai Street, Chaoyang District, Beijing, China, 100020
Tel: + 8610 6554 6931
Fax: + 8610 6554 6932
www.greenpeace.cn