

Resource and Energy Problems in China and Energy and Environmental Studies of Shanghai Jiao Tong University

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Abstract

In this paper, author introduces energy resource reserves, energy and resource problems in China, Shanghai Jiao Tong University and energy and environmental studies. The result shows that (1) China occupied rich energy resource reserves. In energy resources, coal occupied 77.7 percent for electronic power. From the structure of energy resources, China's structure of energy is not good and need to adjust. Now Chinese government has launched to develop renewable energy such as wind power, solar energy, geothermal energy, and ocean tide energy; to enhance efficiency of energy utilization; to reduce CO₂ emissions. (2) Shanghai Jiao Tong University has high level researchers in energy and environment. We hope that SJTU collaborate with Kyushu University in novel carbon resource sciences, energy and environment including student exchange, young teacher training, academic exchange, and scientific research projects. (3) China's government attaches great importance to energy and environmental problems. A lot of investment have put into research projects of energy and environment. Reduction of CO₂ emissions and environmental improvement are important task of Chinese government.

Keywords: Energy, Resource, China, Environmental studies and Shanghai Jiao Tong University

Introduction

There is rich reserve of energy resource in China, and China is the second largest country in energy production and consumption all over the world. China occupies 604.4 billion tonnes of total coal resources, but 114.5 billion tonnes of the available resources. There is 94 billion tonnes of total petroleum resources, but about 13 to 15 billion tonnes of the available resources. Total natural gas resources are 38 trillion m³, but available resources are only 7 to 10 trillion m³. There are 253 billion Watt

of wind energy resources, 630 billion Watt of marine energy resources, 379 billion Watt of available hydro-power resources, and 462.7 billion tonnes standard coal of geothermal energy resources.

Although there is rich reserves of total energy resources, but energy resources of per capita are lower than average energy resource of per capita around world. China occupies 79 percent coal resource per capita of average energy resource per capita around world (100%), 6.1% petroleum resources per capita of average energy resource of per capita around world (100%) as shown in Figure 1.

China is the biggest country of population. From 1971 to 2007, China's population increases from 841.1 million to 1319.983 million as shown in Figure 2.

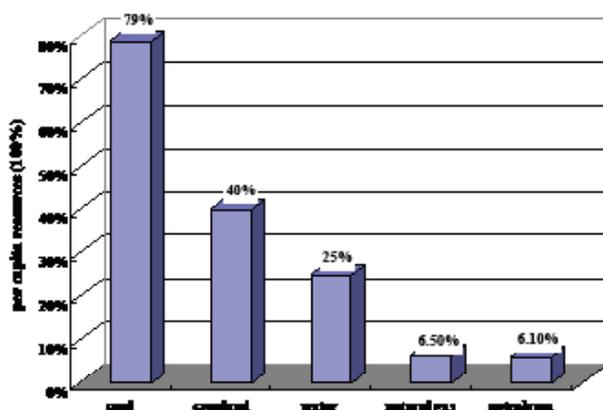


Fig. 1 Comparison of main resources per capita of China with the average resource per capita in the world (100%) (Data source from IEA, World Energy Outlook, 2007).

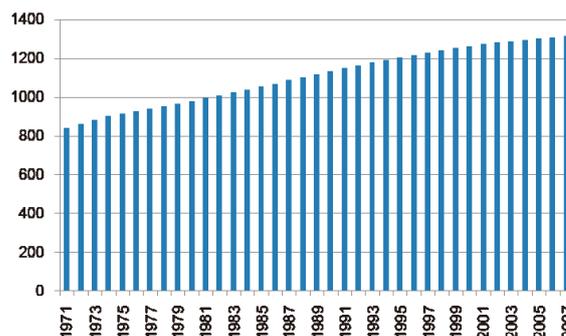


Fig. 2 China's population from 1971 to 2007 (millions) (Data source from IEA, 2009).

From 1980s, China's government launched reformation and opened for outside world. China's government put forward reformed policy as centre of economic construction. Especially from 1990s, China's economy rapidly developed and improved Chinese standard of living. Form 1995 to 2007, China's GDP using change rates rapidly increased from 792.789 US dollars to 2387.678 US dollars as shown in Figure 3.

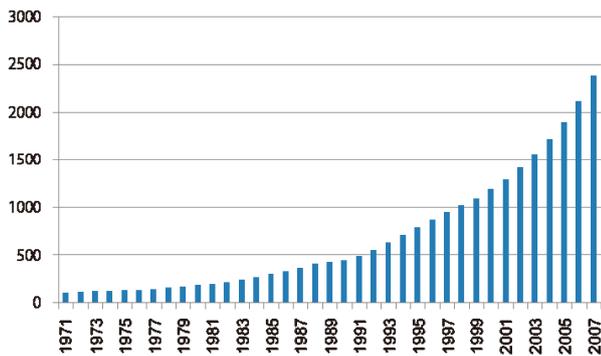


Fig. 3 China's GDP using change rates from 1971 to 2007(billion 2000 US dollars) (Data source from IEA, 2009).

With economic development, energy demands grow quickly up due to industrial development. China's total energy consumption increased from 1.43199 billion tonnes standard coal in 2001 to 2.6548 billion tonnes standard coal in 2006 as shown in Figure 4.

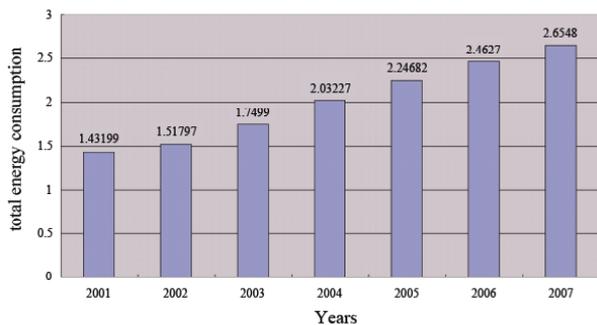


Fig. 4 China's total energy consumption from 2001 to 2007 (billion tonnes standard coal)(Data source from IEA, World Energy Outlook, 2007).

To satisfy economic construction, energy industry quickly developed too. In 2007, China's total installed capacity of electric power reached 713.29 GW (see Figure 5), in which there are 77.7 percent of fossil fuel power, 20.4% of hydro-power, 1.2% of nuclear power, 0.6% of wind power, and 0.1 of other power as shown in Figure 6.

Because coal is as main energy resource in all resources in China, CO₂ emissions have continuously increased, especially from 2003 to 2007 as shown in Figure 7 and Figure 8. Energy production has resulted in environmental

pollution. From the total amount of CO₂ emissions, China is the most volume of CO₂ emissions in the world (see Figure 9). But from per capita amount of CO₂ emissions, China is average level of world. Then, China needs to adjust the structure of energy resource use. It is important that China need to develop renewable energy such as wind power, solar energy, marine energy, and geothermal energy.

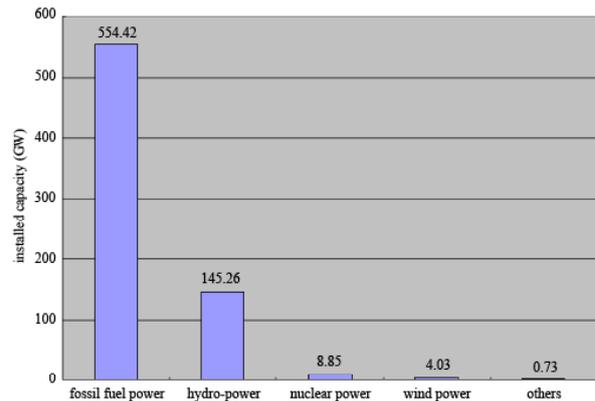


Fig. 5 China's total installed capacity of electric power in 2007(Data source from IEA, World Energy Outlook, 2007).

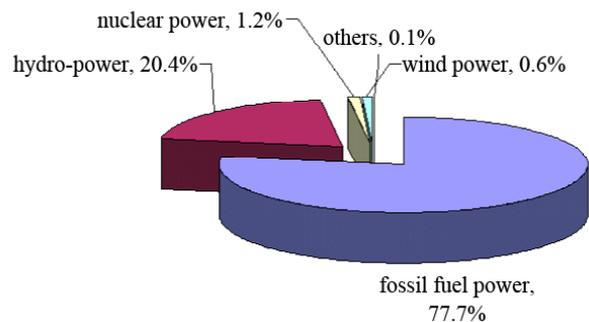


Fig. 6 China's structure of electric power in 2007(Data source from IEA, World Energy Outlook, 2007).

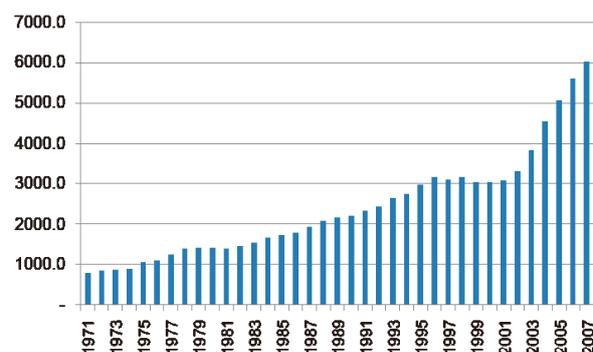


Fig. 7 CO₂ emissions from 1971 to 2007 (million tonnes of CO₂) (Data source from IEA, 2009).

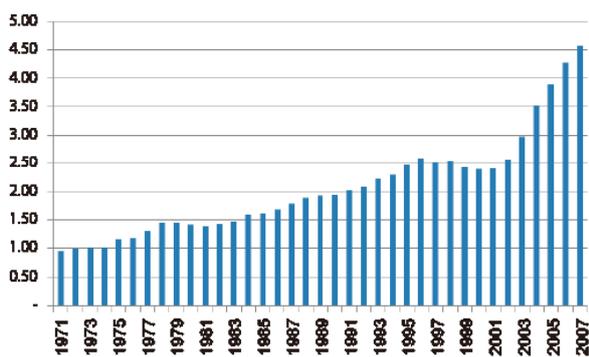


Fig. 8 CO₂ emissions per capita from 1971 to 2007 (tonnes of CO₂) (Data source from IEA, 2009).

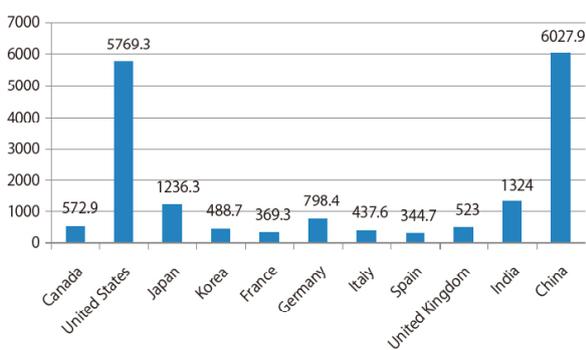


Fig. 9 CO₂ emissions of main nations of the world in 2007 (million tonnes CO₂) (Data source from IEA, 2009).

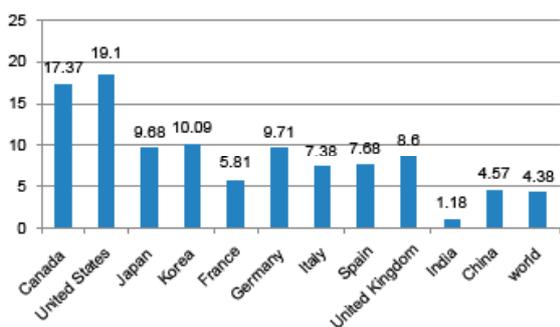


Fig. 10 CO₂ emissions /population of main nations of the world in 2007 (tonnes CO₂ per capita) (Data source from IEA, 2009).

General Introduction of Shanghai Jiao Tong University

Shanghai Jiao Tong University formerly the Nang Yang Public School was founded in 1896 by Mr. SHENG Xuanhuai. It is one of the oldest universities in China. The University, through its century-long history, has nurtured

large numbers of outstanding figures and made significant contributions to the thriving and prosperity of the nation and the development of science and technology. Of all the academicians of China's Academy of Sciences and Academy of Engineering, more than 200 are the alumni of Jiao Tong University.

Today SJTU boasts 26 academic schools, school of Environmental Science and Engineering is one of 22 schools. There are 72 undergraduate programs, 243 masters-degree programs, 147 Ph.D programs, 26 post-doctorate programs, 20 State key doctorate programs and 10 State key laboratories and National engineering centers.

SJTU has 3135 full-time faculty and boasts a good number of famous scientists and professors, including 32 academicians of the Academy of Sciences and Academy of Engineering, 736 professors and 1,178 associate professors.

Its total enrollment of full-time students amounts to 48,900. There are 20,000 undergraduates and 18,700 candidates for Master's Degree, 4,700 candidates for Doctor's Degree and 5,500 oversea students.

Shanghai Jiao Tong University has five campuses including Xuhui, Minhang, Luwan, Qibao, and Fahua campuses, covering up an area of about 400 hectares. The central campus of Shanghai Jiao Tong University is Minhang campus, covering up 300 hectares (3.0 square kilometers).

Associated study of Shanghai Jiao Tong University

(1) Energy studies

Shanghai Jiao Tong University has Energy Research Institute with 45 Professors. The main research interests include thermodynamic cycle theory and system integration, thermal fluid mechanics and thermal energy machinery, combustion control and environment technology, substitution energy and dynamic system, refrigeration air conditioning energy use, the heat science and nano- and micro-system heat transfer mass, solar energy and building energy conservation, biomass energy, the wind electricity generation and the control system, the hydrogen energy and the fuel cell, clean fuel production and biochemical industry transformation, and energy strategy and policy.

(2) Environmental studies

Shanghai Jiao Tong University has School of Environmental Science and Engineering with 18 Professors and 26 associated Professors. The School has 230 full-time undergraduate students, 100 candidates for master degree, 50 candidates for Professional Master degree, and 90 candidates for Ph D degree. The main research interests include water body pollution control and ecological remediation, soil and groundwater contaminant remediation, surface and subsurface water modeling, marine environment, wastewater treatment, atmosphere pollution control and air quality modeling, solid waste treatment and reuse, environment-friendly

recycle technologies and equipments for waste electrical and electronic equipment, environmental functional materials, environmental monitoring, assessment and management, environmental sustainability, environmental policy, environmental chemistry and eco-toxicology, and membrane science and technology for water treatment and sea water desalting.

Conclusions

China occupied rich energy resource reserves. In energy resources, coal occupied 77.7 percent for electronic power. From the structure of energy resources, China's structure of energy is not good and need to adjust. Now Chinese government has launched to develop renewable energy such as wind power, solar energy, geothermal energy, and ocean tide energy; to enhance efficiency of

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References

- 1) International Energy Agency, 2009, <http://www.iea.org/>
- 2) World Energy Outlook, 2007.