Politicization of Global Warming and Energy Restructuring in China

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Abstract. Among the problems concerning climate environment, global warming is one of them drawing the highest attention all over the world. The basic assumption is that the concentration of carbon dioxide in the atmosphere is positively correlated with global temperature. Under the premise of assuming that the concentration of carbon dioxide provided by the nature is constant, carbon dioxide generated from human activities is the crime culprit of global warming. In fact, from the scientific research point of view, a high-degree consensus has not yet been reached in respect to the global warming issue. Since the end of 1980s, it has converted from undetermined statistical prediction in various aspects to certain definitive well-recognized international consensus and become an important factor in the international political game through all efforts of political powers. In recent years, China is devoted to adjust energy structure and playing the role as a big power in terms of emission reduction and limitation. As a result, the leadership in renewable energy sources is quietly transferred from US to China. The move allows China to take the moral high ground and intensify its strength and standing in global governance.

1. Introduction

Among the issues concerning the climate environment, global warming is one of them drawing the highest attention all over the world. The basic assumption is that the concentration of carbon dioxide in the atmosphere is positively correlated with global temperature. Under the premise of assuming that the concentration of carbon dioxide provided by the nature is constant, carbon dioxide generated from human activities is the crime culprit of global warming[1]. The IPCC Climate Change Impact Report in 2007 gives detailed scientific explanation: since 1750, human beings began to use fossil fuels in a large scale way, and the concentration of the greenhouse gas mainly contained in the atmosphere rose from 292ppm prior to the industrial revolution to the 379ppm at present, far more than the record (180 to 330pm) for 650,000 years before Antarctic ice core, resulting in that the average temperature on the earth surface between 1906 and 2005 rose by 0.74℃. Meantime, it also pointed out that, the global temperature currently was relatively warm compared to the past five hundred years, even one thousand years. The warm climate will trigger series of natural hazards resulting in human destruction. This kind of argument with resort to human's fear gradually won great popular support as both media and governments repeatedly propagated and stressed in 1970s~1980s.

2. Global Warming Issue: From Scientific Prediction to Political Game

In 1896, Svante Arrhenius, a Swedish chemist, was the first to put forward the calculation report of "carbon dioxide (CO2) leading to global warming" and pointed out that the Earth's average temperature will vary with change of content of carbon dioxide in atmosphere[2]. Inspired by him,

David Keeling, an American chemist, concluded through a large number of measurements that "human-caused carbon dioxide emissions are large enough to cause global warming"[3]. By 1970s~1980s, a great number of scientists made demonstration for such conclusion in their books and works, so that the argument of "global warming" gradually won great popular support. Since global warming is involved in humane safety, all kinds of powers started participating in study on global warming and resistance to further deterioration of global warming. In 1988, TPCC was founded, and global warming began to convert from undetermined statistical prediction in various aspects to certain definitive well-recognized international consensus. Through all efforts of political powers, it became an important factor of the international political game.

2.1. Scientific Prediction: Arguments Always Exist

In fact, from the scientific research point of view, a high-degree consensus has not yet been reached in respect to the global warming issue. Especially at the end of 2009, several top-class climatologists' emails and documents were hacked and made public, known as "Climategate" incidence, resulting in heavy discount of the credibility of climate warming. In terms of main arguments for global change theory: Earth temperature is positively related to concentration change of carbon dioxide, and increase of CO2 concentration will cause Earth temperature rise. Some scientists once made the temperature data reconstruction analysis, but it's difficult to judge whether increase of CO2 concentration caused the Earth's temperature rise, or the other way around. Siegfried Fred Singer believed that "However there is no evidence that this high CO2 is making a detectable difference." It should in principle, however the atmosphere is very complicated and one cannot simply argue that just because CO2 is a greenhouse gas it causes warming[4]".Dennis T. Avery believes that the global warming is part of a natural cycle and therefore unstoppable[5]. Water vapor has the action as high as 60% to global greenhouse effect, while the effect by carbon dioxide only accounts for 20%[6]. Neftel A and Oeschger H from Physical Laboratory Institute of Bern University studied the relationship between carbon dioxide concentration and temperature change using Byrd time scale and found that change of carbon dioxide concentration in the atmosphere clearly lagged behind the change of global temperature in the period between 200 and 1200 years[7]. Dominique Raynaud[8], et al from France, Hubertus Fischer[9], et al from Wagner Institute for Polar and Marine Research, and Eric Monnin[10], et al from Switzerland did the corresponding research on change of C02 concentration and temperature change. These research contents showed that carbon dioxide concentration change lagged behind the Earth's temperature change with lag phase from hundreds of years to a thousand years.

In addition to the temperature data reestablishment analysis, the climate change rule and its effect on human life can also be analyzed from archeology point of view. Chu Kochen, a Chinese meteorologist (1890~1974), wrote an article named Initial study on climate change in China for five thousand years in 1972 through study on the climate change using abundant historical materials, which mentioned that China underwent four warm periods and four cold periods in total during five thousand years of history and both cold and warm periods appeared alternately. The following conclusions were made: (1) In the first two-thousand years of the nearly five thousand years, i.e., from Yangshao culture to Anyang Yin Ruins, the annual average temperature in most of time was about 2℃higher than that at present. The temperature in January was about 3℃～5℃ higher than the temperature at present. During the period the temperature went ups and downs, nevertheless, it's impossible to discuss more since the study was only limited to documentation. (2) From then on, the temperature went ups and downs, with the minimum temperature appearing in the years of respectively around BC1000, 400, 1200, 1700, with the fluctuation range of 1℃～2℃. (3) Each period from four hundred to eight hundred years can be divided into small cycles in a unit of fifty to one hundred years per cycle with the temperature range indicating 1℃～0.5℃. The institute of Geographic Sciences and Natural Resources Research of CAS put forward in 2010 that, China had warm period at Western Han and Eastern Han Dynasties (BC210-AD180), warm period at Sui and Tang dynasties (AD570-780), warm period at Song and Yuan dynasties (AD950-1300), warm period at the contemporary age (AD1921-), where the warmth during Sui and Tang dynasties was slightly higher than modern warm period.

More interestingly, the four periods were distributed in the most prosperous duration of Chinese historical culture and China did not suffer any severe catastrophic disaster due to temperature rise.
China Five-thousand-year Civilization left us abundant historical materials, including some records about the emperor's spring ploughing. In ancient China, the emperors' spring ploughing was an important state celebration, so the corresponding record was also prudent and accurate. This could prove that the temperature at Sui and Tang dynasties was slightly warmer than nowadays.
For example, as recorded in Old Book of Tang Biographic Sketches of Emperor Taizong,

> *"In Kuihai of lunar January of the third year of Zhenguan, Emperor Taizong farmed in Xi'an City in person known as JiTian Ceremony".*
>
> *As recorded in New Book of Tang Biographic Sketches of Emperor Xuanzong, "in Yihai of lunar January of the twenty-third year of Kaiyuan, the emperor offered sacrifices to the agricultural ancestor in person".*
>
> *As said in History as a Mirror Tang Record," in Yimao of lunar January of the second year of Ganyuan, the emperor held JiTian Ceremony".*
>
> *The time when the emperors farmed and held JiTian Ceremony as recorded in these historical data was basically between "Beginning of Spring" and the "Rain Water", 10 ~20 days earlier than the days after Insects Awaken at present.*

During the Sui and Tang dynasties (AD570-780), there were a great amount of written record concerning that no ice or snow appeared in winter in Chang'an Area. In New Book of Tang and Old Book of Tang, there were 25 parts with the recording of no appearance of ice or snow for 23 years. The days with no appearance of ice or snow in winter appeared so many times, which could also reflect that the period of Sui and Tang dynasties was indeed an age in relatively high temperature among history of earth. In addition, a great amount of historical data concerning plant growth, farming habit, etc., showed that temperature feature in Sui and Tang dynasties was very similar to that in modern times. It can be seen that the Earth is capable of adapting to the temperature rise and climate warming, and the warming period happens to coincide with the period of economic and cultural prosperity in history, which will not lead to devastating disasters.

2.2. Political Transformation: International Power Game

At the end of 1980s, US broke out the worst high-temperature and drought disaster since 1930, and South Africa also broke out the drought in the same period. The large-scale natural disasters drew people's attention to the living environment, and therefore, the global warming issues previously only discussed in scientific community were begun to be reported massively by media, which gradually attracted political powers in various aspects to participate, resulting in political transformation of global warming issues.
Some scientists began to spontaneously organize to carry out more and more extensive interdisciplinary interactions and exchanges among countries. In Villach Conference held in Austria in 1985, the scientists from all countries proposed that the governments should take measures to intervene the climate warming situation on Earth. At the subsequent Toronto Climate Conference, the scientists from all countries untied together to request the governments from all countries to set up the strict emission reduction targets all over the world and make corresponding policies to control the tendency of global temperature rise.
In 1988, Intergovernmental Panel on Climate Change (IPCC) was founded. It was not a scientific institution or political group in the strict sense, but the mixed body of science and politics, keeping close relationship with the national laboratories, weather bureaus, and scientific institutions in different countries. IPCC is not engaged in any scientific research, but responsible for publishing the climate assessment report every five years by searching the papers concerning climate change released in the influential publications, concluding the existing knowledge regarding climate change, and providing the basis for the political decision-makers in all countries to make related decisions. By far, IPCC has successively completed five assessment reports, with high influential power in the climate change field.

Besides scientific community and Political Science Group, some high-level statesmen also openly support the global warming viewpoints. Margaret Thatcher, Prime Minister of UK, firmly supported the global warming argument and claimed that global warming was a critical political affair worth fund investing for research, which received endorsement and support by other countries in the continent of Europe. Intervention of political power showed that global warming issue had been converted from the undetermined science argument in the laboratory to a chip for negotiation on the conference table among statesmen. Afterwards, aimed at the emission reduction and limitation issue controlling temperature rise, the countries started to carry out long-term political game, global warming gradually became a determined political consensus existing in the field of international political negotiation.

3. Competition of the Political Economic Interests among Countries around the Global Warming Issue

At present, international political negotiation concerning global warming has become an important topic in the process of international political negotiation. One of the theoretical assumptions about global warming is that, increase of concentration of carbon dioxide emitted by human activities will lead to rise of the Earth's temperature, resulting in large-scale natural disaster. Therefore, emission of carbon dioxide among countries becomes a core issue for negotiation. This is also related to the production mode and economic development pattern of the countries all over the world, involved with political and economic interests of political powers among countries, and also concerns redistribution of political powers and economic benefits in international society and establishment of moral banner. Through the international political negotiations over the years, it can be seen that the international society is divided into three camps: European Union, Umbrella Group represented by US, and the developing countries including China, India and Brazil.

3.1. European Union

In terms of global warming, European Union is a primary enabler all the time from official initiation until now. The European Union undergoing industrial age has both capital and technology advantages in respect to new energy and environmental protection industry, with the clean energy accounting for a large proportion in the energy structure. Conclusion of emission reduction and limitation agreements around the world is not only good for European Union's development in energy, industrial and agriculture, and production mode, but also in favor of occupying the leading position in new energy competition for EU, indicating positive influence in determining and solidifying its future international standing. Therefore, EU always regards the global warming issue as the international moral consideration concerning future human social development and spreads all over the world. At the stage when UN Framework Convention on Climate Change and Kyoto Protocol was coming into effect through negotiation, EU played a leading role.

3.2. US and Umbrella Group

US, Japan, Canada, Australia, and New Zealand, and other western developed countries other than EU haven't made any positive response to global warming issues as emission reduction and limitation will cause loss to economic interests of these countries since their manufacturing industries are developed and greenhouse gas emission is enormous in these countries. In the meantime, establishment of any international political structure and dominant right are very important, so holding dominant right means the country is able to obtain the benefit for itself from the international political structure. At present, the core of international cooperation for global warming control is to manage the carbon dioxide emissions, and EU who is actively promoting global emission reduction all the time has already held the initiative in planning and supervision of carbon emission, built the climate political pattern in favor of EU. Therefore, America is always resistant to the existing climate political and political pattern. Japan, Australia, and Canada are also pendulous about the emission reduction issue, who sometimes advocate emission reduction, while drop out the agreed protocol other times. These developed countries with fluctuating attitudes about high carbon emission lead to little effect on global emission reduction. From the carbon emission point of view at present, emission load in developed countries has reached to peak, and these countries have gone on the way of using clean energy or

industry transfer, and technological advantage to realize carbon emission reduction. In fact, from actual range point of view, emphasis and stress of emission reduction is placed on developing countries including China, India, and Brazil, etc.

3.3. Developing Countries

Throughout global history, nearly all the developed countries have their process of modernization completed through an enormous amount of energy consumption and have undergone the stage of high emission of carbon dioxide. At present, the developing countries are in the process of the industrialization construction, and most of countries have to undergo the highenergy consumption stage. Reaching the emission reduction target forcibly will take enormous impact on economic development of developing countries, resulting in certain shock to economic prospect of developing countries. Politicization of global warming basically forces developing countries to go on the road of transformation of economic development and adjustment of energy structure. Since China is the world second largest economic entity, also as a country with high carbon emission, therefore, China always bears huge pressure during climate negotiation. As a developing country, China has to not only keep rapid economic development but also take emission reduction responsibilities, which is an enormous economic and social challenge.

4. Adjustment of China's Energy Mode

The conversion of global warming towards politicization makes it important to monitor carbon dioxide emission all over the world. Controlling carbon dioxide emission in their own country becomes a major factor of each country's national obligations（Table1）. As two largest countries concerning carbon dioxide emission in the world, China and US, as believed by international society, of course should take great responsibilities(Figure 1).

On June 3, 2017, US announced to withdraw Paris Agreement in spite of objections from all other countries. China, as the world first carbon emission country, becomes the focus of attention immediately in the world, and therefore bears heavier international responsibilities in terms of emission reduction. Nevertheless, China always keeps positive attitude and gradually takes new clean energy structure targeted at carbon emission reduction.

As predicted in National Energy Development Strategy (2014~2020), the total primary energy consumption in 2020 will be controlled to be 4.8 billion ton of standard coal. As predicted in 13th Five-year Energy Planning Report, the total primary energy consumption in 2020 will be controlled to be 5 billion ton. As described in China Energy Outlook 2030, the growth rate of the future energy demand is expected to slow down and the total primary energy consumption in 2030 will be controlled to be 5.3 billion ton of standard coal. Meantime, the primary energy consumption structure will be continuously optimized, with the coal proportion decreasing dramatically, clean energy consumption increasing continuously. By 2020 and 2030, the coal proportion will be respectively 60% and 49% and non-fossil energy proportion will be respectively 15% and 22%.

In 2006, China issued and implemented the Renewable Energy Law, in order to guarantee development of renewable energy source by law and provide effective fiscal subsidies and tax preference for solar energy, wind energy, and biomass energy. It mainly includes three aspects: the first is to make further detailed plan within the national range, including renewable energy power industry development; the second is to provide guarantee for power enterprises to take over the renewable energy enterprises; the third is to increase the renewable energy fund in order to expand the proportion of sales electric energy. At present, Chinese government is vigorously promoting construction of natural gas facilities of decentralized energy system, in order to centralize the energy intensity by constructing the decentralized energy system including 1000 projects and distribute the renewable energy sources in the rural area. In general, China is pursuing to establish the modern energy industrial system to guarantee stable, economic and practical, and clean energy development (Figure 2).

Table 1. Top 10 Carbon Emission Countries in 2014

Country	1988	2014

CHINA	2,369,502	10,291,927
United States	4,892,526	5,254,279
India	527,564	2,238,377
Russian Federation		1,705,346
Japan	989,082	1,214,048
Germany		719,883
Iran, Islamic Rep.	176,115	649,481
Saudi Arabia	202,554	601,047
Korea, Rep.	221,960	587,156
Brazil	209,364	529,808

Data source: World Bank Website (https://data.worldbank.org)

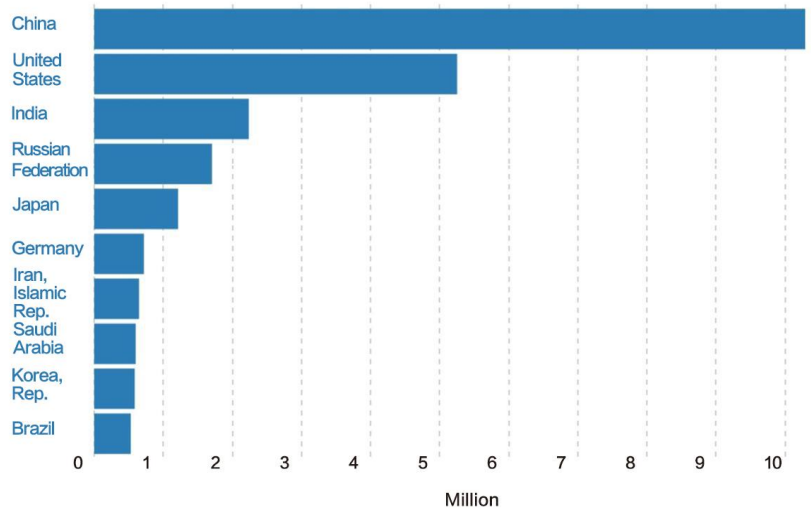

Figure 1. Emission Comparison of Major Carbon Emission Countriesin the World in 2014 (in Kt)

Data source: World Bank Website (https://data.worldbank.org)

4.1. Petroleum

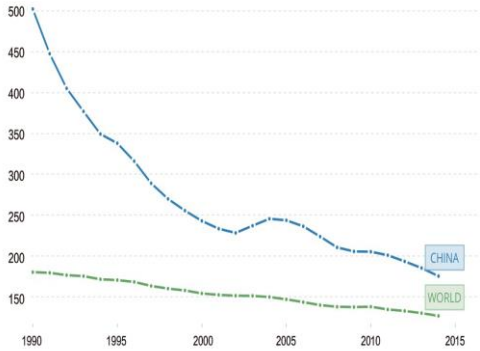

Figure 2. Energy use (kg of oil equivalent) per $1,000 GDP (constant 2011 PPP)

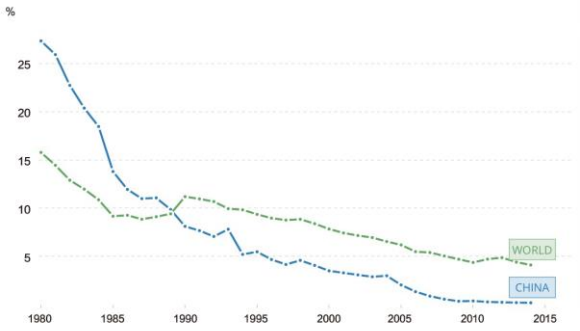

Figure 3. Electricity production from oil sources (% of total)

China has high oil consumption and high oil external dependence. Currently, China's energy policy is aimed at promoting clean development of fossil-fuel energy, developing the petroleum resources by advanced technological means, and eliminating production structure with outdated capacity. Meantime, the exploratory development is intensified in order to improve recovery efficiency of the old oil extraction rate and guarantee steady improvement of the capacity. The alternative clean energy industry shall be developed at the same time. At present, the power generation with petroleum as the

energy in our country drops significantly, up to the low level from 8.103% in 1990 to 0.168% in 2014 (Figure 3).

4.2. Coal

China is the largest country with coal production all over the world and also the one with the highest carbon emission due to coal consumption. At present, China uses coal as the main energy for power generation, with its proportion far higher than the world average level (Figure 4). To realize the emission reduction target, it's necessary to promote transformation of related industries to the clean energy industry. China is devoted to transforming the backward production capacity of the coal by means of modern technological means. Meantime, special attention is paid to investment of clean coal technology and creation of green mining area. For example, the liquid perfluorocarbon project is tried out in the Inner Mongolia now, to prevent the coal from burning in atmosphere using carbon capture, fossil fuel manufacturing, and other technologies. The technology is expected to be a key growth area for China energy transformation. At the beginning of 2016, China also issued a serial of reform measures in order to consume the excess capacity in domestic coal industry, hence to improve the productive forces and profit capacity. The focus of the reform was to eliminate the small-scale coal mine with low production efficiency and encourage large-scale merging and reorganization. The effect of reform was quite remarkable. As a result, the domestic coal production decreased sharply and coal price increased rapidly. In 2016, the annual coal production decreased by 7.9% (-140 million oil equivalent), forming the maximum price drop throughout history (Figure 5).

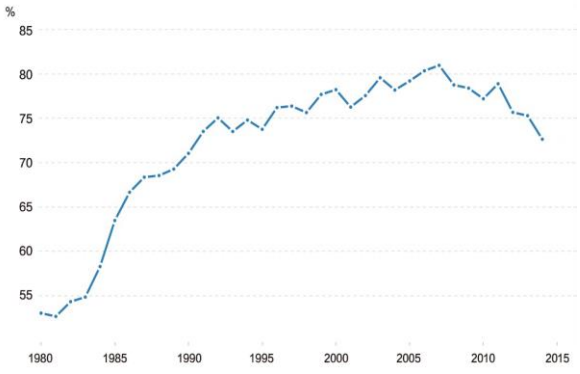

Figure 4. Electricity production from coal sources (% of total)

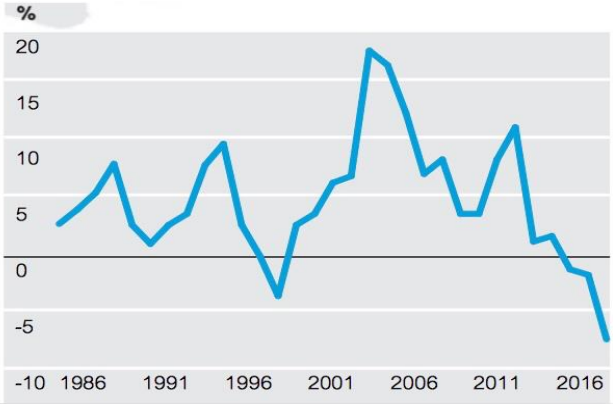

Figure 5. Annual change rate of coal production growth in China (Data source: BP Yearbook of World Energy Statistics, June 2017)

4.3. Natural Gas

The natural gas, as the cleaner energy than other fossil fuels, has an important strategic position in undertaking the international responsibilities of emission reduction and limitation. However, China does not have sufficient natural gas reserve, with the energy characteristics of "rich coal, poor gas, and little oil". Therefore, China puts forward the "equal stress on oil and gas" policy to gradually increase the natural gas production and seek for balanced utilization of natural gas resources. As seen from the reserve capacity of natural gas in China, the natural gas reserve in China is basically distributed in east area and west area, while the important refining and chemical industry base is distributed mainly in China Yangtze Delta, Pearl River Delta, and Circum-Bohai Sea Region. Therefore, China is devoted to creating the trans-regional integrated management mode integrating oil & gas exploitation and oil & gas extraction.

4.4. Nuclear Energy

Nuclear energy, wind energy, and solar energy are used as the green energy. Nuclear energy is used in order to facilitate to optimize natural energy structure and reduce carbon dioxide emission. Therefore, China will always focus on nuclear energy development in recent years. China has built more than 11 nuclear power stations by far and looks forward to promoting the technological innovation with nuclear energy as the core by more and more investment (Figure 6). Since uranium as the main element of nuclear raw material is a comparatively scarce element and the proved reserves in China don't have long service life, China is seeking for uranium resource in other countries of the world, in order to further develop the nuclear energy in the country(Figure 7).. In 2016, China put five nuclear reactors into production, indicating the maximum annual grown in the nuclear energy history of China. In addition, there are additional 20 nuclear reactors under construction.

In 2016, all the net growth of nuclear energy all over the world comes from China. Annual increment of nuclear energy production in China (+9.6mtoe) became the maximum value among annual increments in all the countries since 2004.

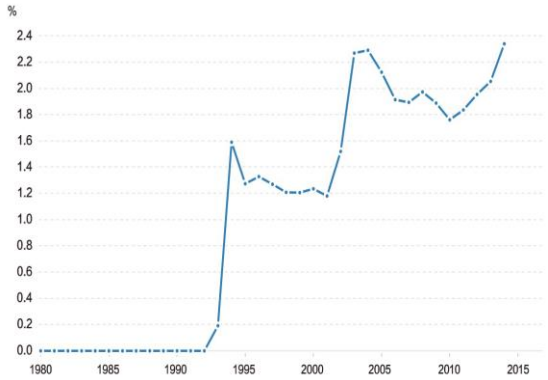

Figure 6. Electricity production from nuclear sources (% of total) (China)

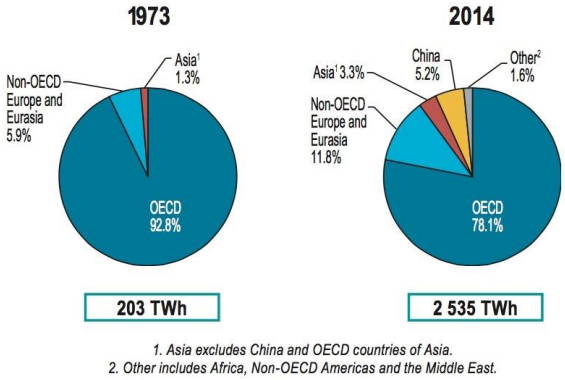

Figure 7.1973 and 2014 regional shares of nuclear production

4.5. Renewable Energy Sources

Through years of development, we have made great achievement in development of renewable energy sources in our country and become the world largest producer and consumer of renewable energy sources at present. In 2016, annual consumption of renewable energy sources in China increased by 33.4%. Over ten years, the proportion of China's renewable energy consumption has risen to 20.5% in 2016 from 2% (Figure 8), where the growth rate of solar energy consumption is the fastest, up to 71.5%. The renewable energy development in our country has come to the stage of the wide-range increment alternative and regional reserve alternative. Meantime, overseas investment for renewable energy sources has accelerated in China and foreign countries. In 2016, the overseas investment is in total of USD 32 billion, increasing by 60% compared to last year. China has taken the leading role in the field of renewable energy resources, owning five of the six largest solar cell manufacturing companies, as well as the world largest wind turbine manufacturer, Li-ion manufacturer, and electric companies. Four out of five energy deal companies in 2016 are Chinese companies.

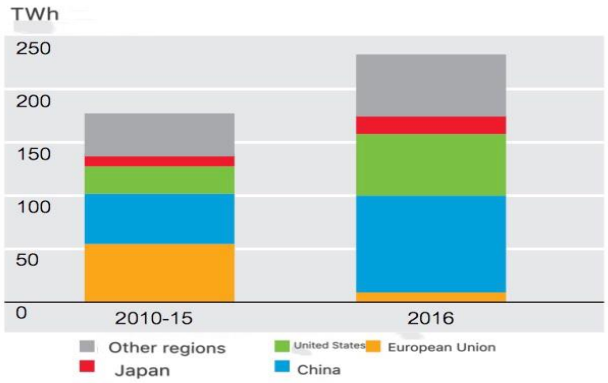

Figure 8. Annual growth and distribution of renewable sources

5. Conclusion

In conclusion, political transformation of the global warming issue makes carbon dioxide emission and clean energy substituting traditional fossil energy become national responsibility and moral principle. As a big power in developing countries, China is always be devoted to emission reduction and limitation and manifests its big power responsibility awareness. As US President Trump made it clear to support fossil fuel and withdraw the climate agreement, the leading role of renewable energy sources will be transformed from US to China. In the future, China will take over USA's climate leadership, which will allow China to occupy the moral high ground and strengthen its power and prestige in global governance.

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