

Renewable Energy to Low Carbon Economy: A Critical Study on Sustainable Development Policy of China

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Abstract

This article focuses on low carbon economy and sustainable development of China. For the past 30 years, rapid economic development has heavily altered the society and environment in this country. Renewable energy contributes to promote three pillars (economy, ecology and society) of national sustainable development model. China is one of the top energy consumption countries in the world; thereby it has been highly committed to increase the use of renewable energy for the purpose of saving ecology along with supporting on sustainable development of the nation. That is the reason from the government level it has been continuously exploring energy from hydropower, wind, solar, etc. It has been promoting low carbon economy applying through various ways such as: law of renewable energy, top 1000 enterprises energy conservation action program, Golden sun and ICARE.

Keywords: China, Sustainable development policy, Renewable energy, low carbon economy

1. Introduction

Climate change is a big concern in the 21st century world community. Indeed, economical development has been strongly correlated with increasing energy use and growth of greenhouse gas (GHG) emissions. The challenges are compounded by the need to provide clean and efficient energy services to the people without access to end "energy poverty". For this purpose, some of the standards of low carbon economy have been developed. As for example recent UN Climate Change Conference, which was held at Paris in December 2015, has produced an agreement, which is historic, durable and ambitious. Both developed and developing countries are required to limit their emission relatively safe levels (2c with an aspiration of 1.5c). All of the participating 196 countries were agree to implement agreements of the conference however they are not legal binding agreements (Harvey, 2015).

Numbers of initiations have been continued to reduce carbon energy and to contribute for sustainable development. As for example Plan of Implementation was adopted at the World Summit in Johannesburg on Sustainable Development in 2002. The governments were called upon with a sense of urgency to substantially increase the global share of Renewable Energy by 2005 (UN, 2002). Globally implemented Low-Carbon Economy, therefore, are proposed, by those having drawn this conclusion, as a means to avoid catastrophic climate change, and as a precursor to the more advanced, zero-carbon society and renewable energy economy.

Renewable Energy (RE) is able to contribute on sustainable development by supporting three-pillar framework – Economy, Ecology and Society – of the national development. RE can play an important role in a comprehensive global strategy to eliminate energy poverty. It is important to remind that year 2012 was chosen as the "International year of the Sustainable Energy for All" by United Nations which alerted governments, private sectors, and civil society partners to achieve three major goals like ensuring universal access to modern energy services, reducing global energy intensity by 40 per cent and increasing renewable energy to 30 % by 2030 (UNEP, IYSEA, 2012). As China is one of the highest carbon emission countries, it has faced strong challenge to meet those objectives.

China has the most strong growing process out of the developing country, for this reason it has been under

pressure not only from the other nations that worry about the future of the planet, but also from its own needs to adopt this change and supply its own needs. Chinese energy strategy started from the economical and political reform and opening up, and was marked in 1980 by Deng Xiao Ping the "Energy is the most important economic issues" supported by the central government's slogan "lay equal stress on development and conservation, give priority to energy conservation for the short term." (Lall, 2009)

It is imperative to say that the 11th Five Years Plan (FYP) is the first economical plan of China after Johannesburg so is expected to have a more clear inclination to adopt changes to a low carbon economy. Indeed, renewable energy offers the opportunity to contribute to a number of important Sustainable development goals, evaluating it in the specific context, (1) social and economic development; (2) energy access; (3) energy security; (4) climate change mitigation and the reduction of environmental and health impacts. If so, what are the strategies that are being adopted by China to guide society to a low carbon economy standard to sustain economical development? (Chain Government Website, 2015)

2. What is Renewable Energy?

Renewable energy has being presented as a good option to a local economy make the transition of a fossil fuel based economy to a low carbon economy, and also to sustain development. It is derived from natural processes that are replenished constantly. In its various forms, it derives directly or indirectly from the sun, or from heat generated deep within the earth. Included in the definition is energy generated from solar, wind, biomass, geothermal, hydropower and ocean resources, and bio-fuels and hydrogen derived from renewable resources (IEA 2008a). It is also believed to have the potential to answer the challenges with respect to the energy sector: energy security; climate change; reducing pollution and public health hazards; and addressing energy poverty. There are different forms of renewable energies such as solar energy, wind energy, hydro energy, etc:

Solar Energy

Solar energy is one of the most abundant energy sources on earth. However, this solar energy must be harnessed and converted into other forms, such as electricity and heat to do useful work. And it must be provided at a cost competitive with more conventional energy sources. Solar energy is an inexhaustible clean energy that provides 99.98% energy for renewable energy (Gao Xinyu et al., 2011).

Wind Energy

Wind energy has been used for a long time. The wind is a simply air in motion which is caused by the uneven heating of the Earth's surface by the sun. Sweep and wind mill was the most important power device before steam engine appearing, using wind to produce electricity, becoming a crucial way to generate energy using wind with advantages of efficiency, purity, recyclability (Zh. Peidong et al., 2009).

Hydro Energy

Hydro energy is generated from water resources. The water is reserved in huge quantity and let it out to flow in great motion to hit turbines that generates electronic energy, which is renewal, clean and efficient (Gao Xinyu et al. 2011). As the water resource is available in suitable location, hydro energy can be easily generated. If the water is in plan location, it is difficult to use because in plan location water can be motionless.

Biomass Energy

Biomass energy is the only one that is renewable green energy resource. It barely discharges any carbon dioxide during burning process; so it can remit greenhouse effect efficiently.

Ocean Energy

Ocean energy refers to renewable resource stored in ocean. Those resources are contained in abundance such as tidal energy, ocean currents energy, Wave Ocean, temperature-difference energy and salinity gradient energy. The current tidal energy alone has reached its maturity, leaving application of most other oceanic energy at their exploitation stage (Gao Xinyu et al., 2011).

Geothermal Energy

Geothermal energy comes from deep layer of the earth. It is a renewable energy resource with zero emission and no secondary pollution. There is a long history in using geothermal energy, which we can see from hot bath being popular since the Roman Empire.

2.1 Low Carbon Economy

Low carbon economy is an economical model featuring low energy consumption, low pollution and low emission, looking forward for an after agricultural civilization and industrial civilization. To systematically talk about low carbon economy, it should date back to 1992 UN Climate Change Framework Pact and 1997 Kyoto Treaty.

However, low carbon economy was first officially referred in the UK 2003 White Paper on Energy titled Low Carbon Economy-The Future of Our Energy. It is based on the issue of realizing high efficiency of energy use, structuring at a clean energy, searching green GDP, and applying technological innovation in energy production to reduce emission. The idea of low carbon economy is raised in the backdrop of global warming, great challenge on human's survival and development. With constant increase of global population and economic scale, people are clear of not only the impact of smog, chemical smog and acid rain, but including the fact that the increase of CO2 in the air causes global climate change.

In 2006, Nocolas, ex-chief economist of World Bank pointed out in his report that an annual investment of 1% of the current GDP in low carbon economy will avoid in the future an annual 5% to 20% GDP, which explains his calling for the transformation to low carbon economy. With this understand and background, important concepts and policies as carbon footprint, low carbon economy, low carbon technology, low carbon development, low carbon living manner, low carbon society, low carbon city and low carbon world is rising in importance by running a low carbon economy model and living a low carbon life, accomplish the sustainable development of the society (UNFCCC, 2007).

As an economic concept enjoying wide social recognition, there is no established definition of low carbon economy. By Dec. 3, 2007, the UN Climate Change Conference was held in Bali Island of Thailand, it was approve to negotiate on new arrangements reacting to climate change before 2009, in which developed countries are duties to reduce their greenhouse gas by 25% to 40% before 2020. These goals push the world into low carbon economy, in July 2008, the 8 members on G8 Summit agreed to work together with other signatories under UN Climate Change Framework Pact to reduce greenhouse gas by 50% by 2050 (UNFCCC, 2007).

2.2 Concept of Sustainable Development

The definition presented was first used at the United Nations released, the Brundtland Report, 1987, which included what is now one of the most widely recognized definitions:

> Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts the concept of 'needs', in particular the essential needs of the world's poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs. (Brundtland Report, 1987)

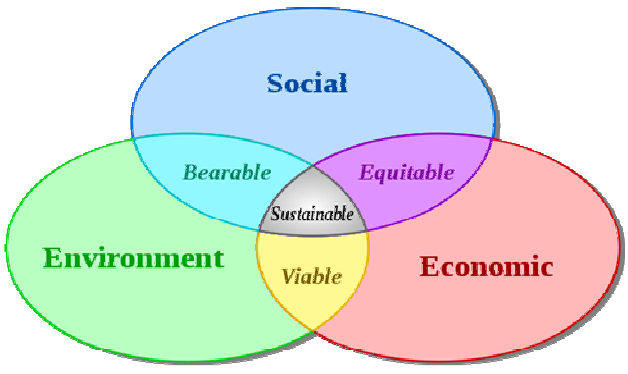

Figure 1: The three basic pillars of the sustainable development: Economic, Social and Environmental

The three-pillar model

Sustainability has a definition traditionally framed on the three-pillar model (Economy, Ecology and Society) where these factors are considered to be interconnected and relevant for sustainability. This model allows a schematic categorization of sustainability concept and allows a schematic categorization of sustainability issues.

To establish a mutually reinforce these components of SD, United Nations General Assembly aims to promote their integration. This view subscribes to an understanding where a certain set of actions (e.g. substitution of fossil fuels with RE sources) contemplates all three-development goals simultaneously.

a) Environmental

Environmental sustainability is to maintain the functions of the ecosystem in a sustainable manner that may also designate as the ability of the natural environment to maintain living conditions for people and other living beings taking into account housing, environment and the beauty of its functions as a source of renewable energy.

United Nations establish main environmental objectives which are: to integrate the principles of sustainable development into country policies and programs and reverse loss of environmental resources; to significantly reduce biodiversity loss; to have the proportion of people without sustainable access to safe water and basic sanitation; and to contribute in poverty elevation (UN Summit, 2005).

b) Social

The socio-political sustainability focuses on balance, both in its social development and socio-economic. It is a vehicle to humanize the economy, and at the same time, aims to develop the social fabric in their human and cultural components. In this regard, two major plans have been developed: The Agenda 21 and the millennium development goals.

c) Economical

Economic sustainability, framed within the context of sustainable development, is a set of measure. Traditional concepts of economy are added as factors but it also adds some environmental and social values. There is also the incorporation of more efficient management of natural resources such as wood, water, wind, etc. to ensure a sustainable development.

3. Criticism on Sustainable Development

The concept of "Sustainable Development" raises several critiques at different levels, but one special call my attention, John Baden chairman of the Foundation for Research on Economics and the Environment (FREE). According to his point of view the notion of sustainable development is dangerous because the consequences have unknown effects, also he develops his critique by noting the vagueness of the expression, which can cover anything. It is a gateway to interventionist proceedings, which can be against the principle of freedom and without proven efficacy. Moreover, he evokes the bounds of public action, which are underlined by the public choice theory: the quest by politicians of their own interests, lobby pressure, partial disclosure, etc.

3.1 Energy Consumption in China

It is widely recognized that stopping global warming is a battle, which cannot be won without China's participation. China's energy consumption relies heavily on fossil fuel， as the world's second largest energy consumer after the US. When it comes to consumption on a per capita level however, China remains low. The vast majority of the Chinese populace still does not own a car and half of the population still lacks access to heating (Guobao, 2009).

According to the annual report stated by the United Nations Environment Programme (UNEP), China firstly exceeded the United States to be the country which made the most investments in renewable energy area in 2009 (Gao Xinjyu et al., 2011). In the same year, China became the world's top energy consumer according to the International Energy Agency (IEA), consuming 2,252 billion tons of oil equivalent energy from sources such as coal, nuclear power, natural gas and hydroelectric power – about 4% beyond US. The Chinese government spent about $1.6 billion on research and development in clean energy and the Chinese private sector invested about $380 million for that purpose in 2011.

Since then it has been keeping this leadership, but during this year, in the Durban World Summit, China presented an investment of $45.5 billion in clean energy in 2011, even being a big amount it caused the country to cede its top ranking in such expenditures to the US for the first time since 2009. This situation is far to stabilize China's ambitious goals to keep increase clean energy (China Daily, 2012-04-13).

China's booming economy, according to the 12th FYP was projected to keep growing around 7% to 8% per year, is high energy intensive, and hence energy demand is likely to increase substantially over the next two decades. For this reason China clearly plays, and will continue to play an important role within the global economy and its environmental sustainability.

China achieved a quadrupling of its GDP with only a doubling of energy consumption between 1980 and 2000.

(Zhang, 2008) In accordance with the National Bureau of Statistics of China, the structure proportions of coal, petroleum and natural gas, renewable energy over the first energy are 68.7%, 21.4% and 9.9% in 2009.

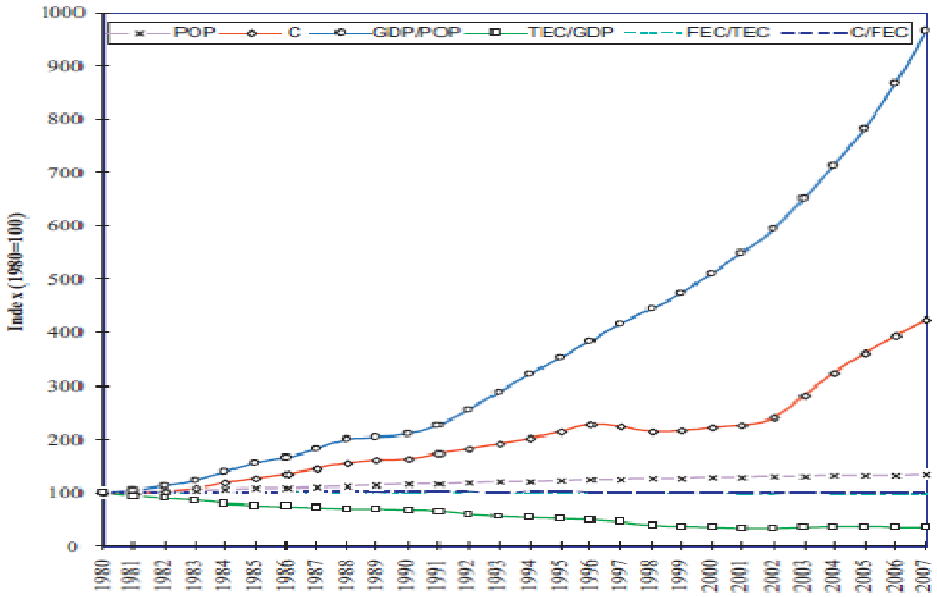

Figure II: Decoupling CO2 emission from economic growth in China, 1980 – 2007; C – the amount of CO2 emissions; FEC – the total carbon-based fossil fuel consumption; TEC – the total commercial energy consumption; GDP – the gross domestic product; POP – the Population.

Today 12% of the world's energy demand is Chinese but the rate of consumption growth four times the world's rate, with a consumption rose by 208% in between 1970 and 1990 compare to the other developed nations, what has an expectation to grow twice more in the next two decades (Hays J., 2012). The country has been calling for energy saving since the early 1980s, during the 11th plan (2006-2010), with the goal of cut energy use per unit of GDP by 20%, China achieved a quadrupling of its GDP with only a doubling of energy consumption between 1980 and 2000, but it was 2002, that it started to experienced faster energy consumption growth than economic growth (Zhang, 2008).

The recent increase in energy intensity in China clearly made it a very challenging goal, given that industry sector – electricity generation, steel, non-ferrous, construction materials, oil processing and chemicals - accounts for about 70% of the country's total energy consumption. (Zhang, 2008) So, the Chinese government has taken great efforts towards changing the current pattern of industrial growth. China also faces important socio-economic irregularities associated with an estimated 23 million people lacking access to electricity (J.A. Cherni, J.Kentish, 2007), representing under 2% of its population of 1.26 billion, and its per capita electricity consumption around 50% of the world average (J.A Cherni, J.Kentish, 2007), also electrification in rural areas remains only partial.

But even with such irregularities, the Chinese demand for energy is soaring as they are buying more cars, moving into bigger houses, more need for heat, more televisions, and many other utensils that need energy and starting new businesses and factories. Heavy industries still use outdated technology and waste and use too much fuel in the production process, industries as energy intensive industries - steel, aluminum, cement and chemicals – use a third of China's total energy consumption; construction for itself accounts around 27%.

The use of energy in China had surged, between 2000 and 2007 it almost doubling. Despite similar rates of economic growth, the rate of growth in China's energy use during this period (9.74% per year) hitting a level of twice of the previous two decades (4.25% per year) (National Bureau of Statistics of China, 2008). Not for the lass that China in the year of 2007 became the world's largest carbon emitter, instead of until 2030 as it uses be estimated. Instead of pushing CO2 emissions down, as it had been the case over the period 1980-2000, this change in energy intensity was responsible for an increase of 20 MtC during the period 2001-2007. (Z.X. Zhang, 2008)

China agency's research suggests that only 11% of the privet investment in clean energy in China was through

public markets, 87% of private investment in clean energy in China came in the form of asset finance, and only 1% privet investment for that purpose came from venture capital equity. In 2007, fossil fuels accounted for nearly 93% of the total energy consumption in China, of which about 75% came from coal (NBSC, 2008). The demand for coal, whose capacity is currently 326GW, is expected to rise by approximately 40%, and furthermore, the percentage of China's energy portfolio made up by coal is expected to increase by around 3% (J.A. Cherni, J. Kentish, 2007). During the year of 2010 the Chinese coal consumption was 3.2 billion metric tons per annum, what was more than 47% of the world coal supply.

Comparison of present (2004) renewable capacity with capacity from coal and other energy sources, and how this is forecasted to have changed by 2010

	Current capacity, 2004 (GW)	Proportion of energy portfolio, 2004 (%)	Forecasted demand, 2010 (GW)	Forecasted proportion of energy demand, 2010 (%)	Forecasted increase in absolute demand, 2010 (%)
Coal	326	74	460	77	40
Renewables	34	8	60	10	76
Other	80	18	80	13	0
Total	440	100	600	100	30

Sources: Based on Shi (2004); Pinsent Masons (2005); Deutschebank Research (2006); Martinot 2002; World Bank (2006).

The country has being the top producer of Coal in the world and is the third when it comes to reserves; it is self-sufficient in coal, with a production 3.06 billion tons in 2010. China used to be a major coal exporter, but its export is decreasing and it may soon become a big importer. According to Oil and Gas Journal – OGJ – China consume 109 billion cubic meters in of coal in 2010. This switch is even more marked for petroleum products. Imports supplied only 18% of China's oil consumption in 1995 but the import share reached 49.3% by 2007 (H. Ma et al., 2010). Coming out from this process China's net imports of petroleum and products have raised, according to China Statistical Yearbook 2005-2008, from 75.8 million metric tons in 2000 to 183.9 million metric tons in 2007. It is oil supply, according to British Petroleum review of world energy, was 4,855 TWh in 2009 that was 10% of the world's supply.

3.2 Towards Energy Efficiency and Sustainable Development Policy of China

China's energy efficiency or the use of renewable energy is low, according to China Energy Statistical yearbook, in 2005 the energy intensity was 0.91 tones oil equivalent per thousand US$ GDP at 2000 prices compared with 0.32 for the world as a whole and 0.195 in OECD. According to the IEA's World Energy Outlook 2008, China will become the top natural gas consuming country in the Asia-Pacific region, overtaking Japan by 2015. The main factors for the higher energy intensity in China and its trend has been a considerable debate, and once its size and high energy intensity, add to improvement in energy efficiency in China, it will also affect world energy demand and in turn the world energy price placing a great challenge for the country itself through new sources (H. Ma et al., 2010).

Scholars have repeatedly observed that production expansion is the major force driving the growth of China's energy consumption (Wang et al., 2009). It achieved a quadrupling of its GDP with only a doubling of energy consumption between 1980 and 2000 (Zhang, 2003), however, it is not an option for China to cut its energy consumption and carbon emissions at the cost of economic growth.

For power generation, China has adopted the policy of accelerating the closure of thousands of small, inefficient coal and oil-fired power plants and is encouraged the construction of large, more efficient, and cleaner plants (Zhang, 2008). In 1986, Chinese government issued the energy-saving design standard for heating in new residential buildings, requiring a 30% cut in energy use relative to the typical Chinese residential buildings designed in 1980-1981. This standard was revised in December 1995, requiring that new buildings be 50% more efficient by 2010 and 65% by 2020 (Zhang, 2008).

In the transport sector, the excise tax for vehicles has been adjusted over time to incentivize the purchases of energy-efficient cars. The new vehicle excise tax implemented since April 2006 has broadened the tax base from the existing range of 3-8% to 3-20% and has increased the categories of engine size from three to six. The government's determination to implementation enforces consumption taxation as an important economic

instrument to promote the production and use of energy-efficient small cars and enhance its policy guidance on energy conservation and environmental protection (Z.X. Zhang, 2008).

In 1996, the state "Development Planning Commission" associated with "State Science and Technology and the State Economy and Trade Commission" made Outline of New Energy and Renewable Energy Development in China of 2010 (Xinyu et al., 2011). With the development goal set at the rate of a 7.2% increase in gross domestic product (GDP) per year between 2000 and 2020 (Wang and et al., 2010), at this rate of growth, China will have to rely on the remaining two ways to cut carbon emissions: reducing energy intensity and increasing the share of renewable energy. Zhang et al. (2006) have found that the potential for further reduction in carbon intensity through improved generation efficiency appears low. Therefore, the development of Renewable Energy and the substitution of fossil fuels for its adoption has been a growing interest of policy makers and scholars for its great potential to achieve the goal of carbon reduction (Wang et al., 2010). In spite of some renewable energy programs established as early as the mid-1990s (Wang et al., 2010), it became a policy issue only in 2005, as Law of Renewable Energy (LRE).

In the same way, the law of Renewable Energy in People's Republic of China has become effective since January 2006. The Chinese government has enacted some policies of pricing of electricity, tax, and investment and so on to support the development of renewable energy. In addition, the government has also set up a special fund for renewable energy development and a system, which can make the renewable energy's pricing of electricity, apportioned (Xinyu et al., 2011). Financial subsidy is the most conventional economic encouragement practice, Chinese government has set up a rural energy special cashing interest loan since 1987, RMB 1.2 x 108 Yuan each year, with cash in interest rate at 50%. Used specially for wind power generation, solar energy heater techniques, the technical research and development, reconstruction, promotion and application of large- and middle-sized marsh gas pools (Peidong et al., 2009).

Temporary Management for the Price and Cost Sharing in Renewable Energy Power Generation is the only regulation that contains product subsidy, stipulating that the subsidized electricity price for biomass power generation is RMB 0.25 Yuan/ (kW h). Since the beginning of the power generation program, it has enjoyed the subsidized electricity price for 15 years (Peidong et al., 2009).

Further, rural Marsh Gas Construction State Debt Program Management Method stipulates, central finance subsidizes the "one pool and three reforms" in accordance with the following standards: RMB 1200 Yuan per household in southwestern and northeastern area, and RMB 1000 Yuan per household in south western area and RMB 800 Yuan per household in other areas. Local government of Tibet, Qinghai, Inner Mongolia provide subsidy of RMB 100-300 Yuan per set to the peasants and cowpunchers in remote areas who purchase solar photovoltaic power generation system (Peidong et al., 2009). Favorable taxation policy is the most universal encouragement policy in the world currently, but it is not so apply in China's Renewable Energy development. Those that were applied on the value added tax for small hydropower is reduced from 6% to 3%; value added tax for wind energy power generation is reduced by 50%;

Also importation of some renewable energy power generation equipment and their parts that China is unable to produce, including key parts of photovoltaic cell and large wind energy power generation equipment, being exempted from taxation or even in some cases have the tax reduced (Peidong et al., 2009). Projects within Great Western Development, the renewable energy power generation projects constructed in western area could also enjoy the tax exemption policy.

In 1994, the previous State Power Department issued management on Joint Operation of Wind Energy Power Plant, in 1999, the State Panning Committee and Science and Technology Department issued support for renewable energy, confirming the policy of favorable price policy, intended for network power produced with renewable energy, represented by guaranteeing the network access and favorable electricity price. The requiring Grid management sectors allowed wind power plants to access the networks at the nearest access point, and to purchase all the power that has accessed the networks; the network price should be fixed in conformance to the principle of paying back the loan and interest and making reasonable profit; the other part of the networks shall adopt average electricity price, and the price difference shall be shared equally by the entire grid (Peidong et al., 2009).

In the same way, technical research and development policy has been well defined in the Mid-and Long-term Development Programming for Renewable energy, which was passed on 7 June 2007. The goal was set that central finance will set up a special fund for developing renewable energy in support of the technical research and industrial construction of renewable energy (Peidong et al., 2009). In September 2007, the Chinese Government promulgated the Medium and Long-term Program for Renewable Energy Development, putting

forward the goal of increasing renewable energy consumption to 10% of the total energy consumption by 2010 and 15% by 2020 (Xinyu et al., 2011).

President Hu Jin-tao pointed it out in the report of 17th People's Congress that, that should develop clean energy and renewable energy, protect land and water resource, build a reasonable and scientific system of utilizing energy resource, enhance the efficiency of using power resource, strengthen the ability of reacting the climate change and make contributions to protect the global climate (Xinyu et al., 2011). There was the establishment of national energy committee to accelerate the adoptions of the renewable energy, as a high-level institution of energy decision making, conducting research about energy strategy, energy structure, energy layout, energy policy, energy price and other international cooperation with energy structure, clear and definite the development target and direction, drawing the nation energy strategy planning for over 20 years (Xinyu et al., 2011).

About laws, regulations and administrative stipulations, Electricity Law of the PRC has been passed in 1995, Energy Conservation law of PRC in 1997 and Air Pollution Prevention Law of PRC in 2000 definitely stipulated that exploitation and use of renewable energy and new energy are encouraged (Peidong et al., 2009).

Later, State Department has come up with an Administration on Joint Networks Wind Power Generation. Further Support on the Development of Renewable Energy, Contents of State Encouraged industries, Products and Development Principles, 2000-2015 New Energy and Renewable Energy Development Principles, Comprehensive Working Programs on Energy Saving and Emission Reduction and so on.

The passing of the Renewable Energy Law (REL) on 28 of February 2005, was in the 14th session of the 10th NPC Standing Committee, bringing the exploitation and use of renewable energy to the strategic height of "increasing energy supply, improving energy structure, guaranteeing energy safety, protecting and realize the structure, guaranteeing energy safety, protecting environment and realize the sustainable development of economy and society (Peidong et al., 2009), demonstrated China's commitment to renewable energy development. In the 3 years after the REL, China's renewable electricity capacity grew rapidly (Xinyu et al., 2011). The law of Renewable Energy in People's Republic of China has been effective since January 2006. Chinese government has made some policies of pricing of electricity, tax, and investment and so on to support the development of renewable energy. In addition, the government also set up a special fund for renewable energy development and a system, which can make the renewable energy's pricing of electricity, apportioned (Xinyu et al., 2011).

Immediately after the passage of PRC Law of Renewable Energy, NPC and concerned sectors of State Department took quick action to stipulate relevant supporting laws and regulations, including investigations on renewable energy resources, total goal, programs on exploitations and use, industrial development content, electricity price policy, cost sharing, special capital, financial support and some other policies (Peidong et al., 2009).

Five sets of supporting laws have been enacted, namely, Guidance a Content for the Development of Renewable Energy Industry, Temporary Method for Managing the Special Capital of Renewable Energy Development, Temporary Management for the Price and Cost Sharing in Renewable Energy Power Generation, Administrative Regulations on Renewable Energy Power Generation, Mid-and Long-Term Development Programming for Renewable Energy (Peidong et al., 2009). The 11th NPC Standing Committee has passed made a decision about modifying the law of renewable energy resource in the 12th Conference. The new law took effect on 1st January of 2010. Compared with the old law, the keynote in it is to harmonize the problems appeared in congress of developing rather than to promote new energy resource (Xinyu et al., 2011).

The REL contains a set of policies and has established Goals for renewable electricity development in China, as the article 4 of the REL, requires that a goal for the amount of renewable energy in China's energy portfolio be established. Based on that, a series of administrative orders and guidelines as the 11th FYP for Renewable Energy Development, and the Mid- and Long-term Plan for Renewable Energy Development were published pointing out the goals (Wang et al., 2010). According to those plans renewable energy should account for 10% of total energy consumption in China by 2010 and 20% by 2020.The growth target in each category is summarized in the following table.

Table: Goals for renewable energy development.

Renewable Energy	2005	Goal for 2010	Goal for 2020
Electricity (MW)	113,580	205,875	
Hydroelectric (MW)	110,000	190,000	300,000
Grid-connected wind (MW)	1260	10,000	30,000
Distributed wind (MW)	250	75	
Solar (MW)	70	300	1800
Biomass (MW)	2000	5500	30,000
Biogas supply (million M^3)	80,000	19,000	44,000
Household biogas (million M^3)	18,000	15,000	30,000
Livestock farm biogas (stations)		4700	
Biogas from industrial effluents (stations)		1600	
Heating			
Solar water heaters (million M^2)	80	150	300
Geothermal heat, etc. (1000 tce)	2000	4000	12,,000
Solar cookers (1000 stations)		1000	
Fuel			
Bio-ethanol (1000 tons)	1020	3000	10,000
Bio-diesel (1000 tons)	50	200	2000
Solid biomass fuel (1000 tons)		1000	50,000
Total (1000 tce)	166,000	300,000	

Sources: The Eleventh Five-Year Plan for Renewable Energy Development (March, 2008); The Mid-and Long Term Plan for Renewable Energy Development (August, 2007)

In the same period targets, hydroelectric represents 80% of all renewable capacity, investors whose total capacity exceeds 5000 MW shall get 3% of their total capacity from non-hydro renewable sources by 2010 and 8% by 2020 according to Mid- and Long-term Plan for Renewable Energy Development.

The State Electricity Regulatory Commission (SERC) published executive order No.25, Rule for Grid Enterprises to Purchase all Renewable Electricity, in 2007, which restated and detailed grid enterprises' responsibility for purchasing all grid-connected electricity. The price at which grid operator purchases renewable energy will not be decided by the market but it will be decided by the government. Special rule for the wind energy, the price will be set based on bid prices for the wind project that comes out of a government-organized tendering process. The other kind of RE price will be set by the government based on a rule similar to the "rate of return" principle: that is, cost plus a reasonable return on capital.

These prices will still be much higher than that for fossil fuel electricity, but the purpose is to guarantee grid access at a government-set price to ensure a market of renewable electricity. The producers would have no incentive to invest in renewable energy development if they were supposed to compete with fossil fuel (Wang et al., 2010). According to Article 20 of the REL and the "Renewable Electricity Pricing and Financing" published by the National Development and Reform Committee (NDRC) in 2006, grid enterprises may recover from their customers the "expenses for getting renewable electricity connected to the grid", and "the difference between expenses for purchasing renewable electricity and those for purchasing fossil fuel electricity of the same amount", what is called cross-subsidization, allowing to recover the cost above purchasing conventional electricity.

At the present there is only one nationwide tax policy favorable to renewable energy development that is the administrative order No.2001-198, which was issued by the Ministry of Finance (MOF) and the State Administration of Taxation in December 201 (MOF and SAT, 2001), four years before REL. One year after the Renewable Energy Law went into effect China's total renewable energy use reached the equivalent of 180 million tons of coal equivalent, accounting for 7.5% of total primary energy consumption in 2006. A relative reduction of 3 million tons of SO2 emissions saved 1000 million cubic meters of water 2006 (Ma et al., 2010).

On the specific energy-saving front, China established the "Top 1000 Enterprises Energy Conservation Action Program" in April 2006. This program covers 1008 enterprises in nine key energy supply and consuming industrial subsectors.

These enterprises each consumed the equivalent of at least 0.18 million tons of coal equivalent (tce) in 2004, and all together consumed 33% of the national total and 47% of industrial energy consumption in 2004. The program

aims to save 100 million tce cumulatively during the period 2006– 2010, thus making a significant contribution to China's overall goal of 20% energy intensity-improvement (NBSC, 2008). In May 2006, empowered by the State Council, the National Development and Reform Commission (NDRC), China's top economic planning agency, signed energy-saving responsibility agreements with these enterprises.

To ensure that the goal is met, achieving energy efficiency improvements has become a criterion for job performance evaluations of the heads of these enterprises. This will help them realize that they should take their jobs seriously because they have a very real stake in meeting energy-saving goals. The first-year's results of the program's implementation are encouraging, with more than 95% of these enterprises appointing energy managers, and the program achieving the energy savings of 20 million tce in 2006 (NDRC and NBSC, 2007).

In 2007, the energy savings of 38.17 million tce were achieved, almost doubling the amount of energy savings in 2006. If savings continue at the 2007 rate, the top-1000 program will exceed its target (NDRC, 2008b). The Top 1000 Enterprises Energy Conservation Action Program would lead to a cumulative CO2 reduction of 220 Mt CO2 during the period 2006 – 2010. For comparison, energy – related CO2 emissions in all Annex 1 countries committed to participating in the Kyoto Protocol are projected to be reduced by 422 Mt CO2 relative to the reference case in 2010 (EIA, 2006). This is nearly about 30% of the estimated CO2 reduction from meeting the aforementioned 20% energy saving goal in China (Zhang, 2008).

Similarly, in 2009, the implementation of "Golden Sun" project released by Minister of Finance, Minister of Science and the National Energy Bureau of People's Republic of China, it is expect to speed up the development of the PV systems with the help of financial aid, technical support and the pull of market. It is estimated that more than 500MW electricity will be generated by PV and more than 10 billion RMB will be invested by the government in 2 to 3 years.

Through this program, the Chinese government will subsidize 50% of investment costs for more than 500 MW of solar power capacity up to 2011, with a maximum subsidy rate of 70% for independent solar power projects in remote areas. With this stimulus, the government plans to have 20 GW of solar power by 2020 from the current 140 MW. With the economically exploitable hydropower potential estimated at 400 GW, the largest in the world, China has speeded up the development of hydropower in recent years, planning to have the total capacity installed of 300 GW in 2020 (NDRC, 2007a).

Issue concerned is to use the grid-connected PV demonstration projects (suitable for large-scaled mines, enterprises and non-profit institutional units), and also, PV demonstration projects for remote areas without electricity. Under the conditions of 300kWp installed capacity, project scale of less than 20 MW for one single province, operating period of more than 20 years, owner's total assets of more than 100 million RMB and the investment of the project accounting for more than 30% of total investment (NDRC, 2007a).

Allowance and Standards for Grid-connected PV demonstration projects with the allowance of 50% of the total investment of the project, for PV demonstration projects for remote areas without electricity with the allowance of 70% of the total investment of the project (NDRC, 2007a). This target amounts to three-quarters of its economically exploitable potential. If the target is fulfilled, the economically exploitable potential of hydropower with favorable exploitation conditions will be fully developed by 2020 in China.

4. Conclusion

Overall, low carbon economy is not just a matter of will but also a need that comes with most of the priorities to establish better solution of everyday increasing ecological problems based on a new concept of development. The low Carbon economy in its mature form is a slow process but for sure is a matter that should face as the future of any nation that wants not only develop but also build a feature for the nation and face human kind as the final destination sharing the same faith. The Sustainable Development will be the only road that will guarantee this future that we all look for, with a health and bearable environment, viable for the economical development and with an equitable society that has no concerns with the end of its resources.

The three pillar models shows that there is a direction that cannot be so easy now to follow, but it is a special first step to understand, evaluate and guide policy makers in their decision making, and also give basic pillars to draw policies to not only develop a better society but a society that knows what it wants giving answers to its economical, social and environmental bases.

Therefore, this study comes to China and its sustainable development because it is the most populate place in the world, and it also has the biggest growing market, that brings very clear consequences, and has the most diverse social conditions insert in so many different environmental conditions, and of course the biggest investment in

sustainable development specially for renewable energy to reduce the carbon in their economy.

The figures of Chinese energy is a practical demonstration of the human ability to deal with fast changes and restructure ourselves, Solar fields, solar panels in the city, the many wind fields been built and changing the Gird, also the big and small hydro power plants that improve every day, the technology development guiding the biomass energy and of course even using the oceans and the energy come from inside of our planet in the Thermal or better saying Geothermal energy.

Through the 11th and 12th FYP, it is possible to evaluate that there is a Sustainable development in China, it is not generalize, but it is growing and finding it is way to expand. The strategy of China for that is not get centralized on this concern but to gradually adopt the actions expected in a medium or long term, adopting actions that can guide the society to the main goal of this country, Harmony society. Projects as the law of renewable energy; top 1000 enterprises energy conservation action program; Golden sun and ICARE have prove the good will of China toward this direction, good experiences to share with other nations that has the will to change their pattern of development but has not hitch the technological development.

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