World Bank and China in Recent Developments with Special Reference to Renewable Energy

Mark Michalski

Introduction

One of the features of the World Bank's[1] assistance in China's current development is to alleviate the tension on the imbalance between its economic and social development, and between its scarce natural resources[2] and the environment. The Bank supports the Government's strategy for scaling up its renewable energy for power generation based on developing a supporting legal and regulatory framework, increasing access to advanced technology and techniques to permit the exploitation of renewable energy resources. To say that we live in an increasingly interdependent, global world is a truism. The meaning of truism, however, is just that it is true. What China does affects a significant portion of the entire world.

China's increasing prowess is entangled with that of the international development community, of which it has become an inseparable and important part. China has a large stake in the future of an international system that has helped it prosper and grow. Yet even as China has become more integrated, it has also grown more powerful and assertive in the international arena, bringing into sharper focus those areas where China's interests and those of the rest of the

Mark Michalski is completing PhD work in public policy and is the World Bank Consultant specialized in procurement training and project implementation. He has taught management and procurement courses at the Jagiellonian University in Krakow, during the 1990s, Poland's transition period. He has contributed chapters in several books and published in journals in Polish and in English.

[1] In keeping with China's changing needs, the emphasis of the World Bank support has shifted from physical development of the energy sector to analytic assistance for transforming the state-owned energy sector to a diversely owned market-based system, with the necessary institutional and regulatory frameworks. Bank supports cleaner fuels and increased energy efficiency. The China Renewable Energy Scale-Up Program will support: (i) technical assistance for wind and biomass energy, and (ii) implementation of renewable energy projects (in wind, biomass, and hydro).

[2] The most prominent feature of China's energy consumption is its heavy reliance on coal. Coal—a highly polluting energy source—comprises about 75 per cent of China's total primary commercial energy use. This coal-dominant energy structure has serious environmental consequences. Locally, emissions of sulfur dioxide (SO2) and particulates from burning coal affect air quality; SO2 in China is causing acid rain damage, soil degradation, deforestation and agricultural losses; while on the global level, carbon emissions from fossil fuels are the culprit for climate change. China's economy is expected to maintain its high growth rate, so continued rapid increases in energy demand are inevitable. Thus, the Chinese government is developing renewable energy sources (hydro, biomass, solar, wind, etc) to satisfy energy needs in a sustainable manner.

world diverge - including how to respect human rights, freedom of speech, religious freedoms, and the use of limited scarce resources.

Current World Bank President[3], Robert B. Zoellick gave the most thorough explanation of China's challenge in a speech to the National Committee on U.S.-China Relations on September 21, 2005, when he served as Deputy Secretary of State and also as a US Trade Representative. Zoellick called on China to act as a "responsible stakeholder" in global affairs. Zoellick pledged continuing efforts to integrate China into the international community[4], but he also stated that the United States would protect its security against the possibility that China might become aggressive, or otherwise prove hostile to both the U.S. and global development interests, including that of the energy sector.[5]

The issues of energy security, the worldwide energy problems, compel policymakers globally to evaluate, encourage and embrace alternative forms of energy. Renewable energy may become the way of the future, but it may only come after significant technological breakthroughs. With a surge in oil prices from around $10/b to over $70/b in the last five years, a faster move by consumers to alternative energy sources and renewable energy solutions could have been expected. It is hard to open a newspaper without seeing some article describing energy challenges, or watch media bites reporting on mounting energy shortages and/or climate erosion. These large tasks can best be carried out by large transnational corporations and international financial institutions - the World Bank, the UN, EU, and arguably under the US leadership.

China is poised to become the world's largest economy within the next half century, in terms of purchasing power parity, according to the Organization for Economic Cooperation and

[3] Mr. Zoellick is eleventh World Bank's President who took over his post July 1st 2007. The World Bank's activities focus on the reduction of global poverty, on the achievement of the Millennium Development Goals (MDGs). The Bank provides low (or no interest) loans and grants to poor countries. The World Bank has the largest renewable energy portfolio of any institution in the world. Since 1990, the World Bank Group has committed about $2.7 billion to the renewable energy portfolio. The total alternative energy portfolio includes 76 projects at a total cost of $7.1 billion, with Global Environmental Facility financing $637 million, and funding for the rest coming from the World Bank Group, private co-funding, and government counterparts.

[4] Center for Global Development hosted in June 2007 a panel discussion on China's growing influence in Africa and Latin America. Key speakers (D. Dollar and C. Madavo) noted that as a result of red-hot economy China is now a development player, a lender and trade partner, particularly in Africa.

[5] See: "Clean Energy and Development: Towards an Investment Framework," prepared by the World Bank. Also, for more information visit http://www.esmap.org , http://www.worldbank.org/ggfr, http://www.ifc.org/carbonfinance

Development (OECD)[6]. The OECD, (informally known as the "rich countries' club") estimates that China's gross domestic product is a bit less than half of that of the 30 OECD member-nations combined. In a best-case scenario, China may become the second largest world economy, after the US, by the new century's midpoint. Economic expansion of that magnitude means China's domestic energy demand over the next two decades will grow at a rate that is faster than any other nation with implications for the rest of the world. From 2000 to 2005, China's energy consumption rose by 60 %, accounting for almost half of the growth in world energy consumption, and the government is grappling with its role as a major importer of oil, with its loss of self-sufficiency and its substantial increases in the volume of import costs. During the last decade, the production of oil has increased annually by 1 percent while consumption levels have increased by over 8 percent. Also, it was only since the mid-1980s that China began to explore other non-conventional energy resources.

China is the world's fifth largest petroleum producer, yet it imported almost one fifth (19 percent) of its petroleum consumption in 1999. In 2000 alone China imported twice as much oil as in 1999.[7] The demand for imported petroleum will continue to increase, given continued economic growth, with imported oil contributing over 40 percent of all petroleum requirements by 2010. By April 2007, the Chinese government had approved 383 projects in wind, hydro and bio fuel power generation, and the use of methane gas from coal beds. From 1980 to 2005, about 5 billion tons was absorbed through extensive reforestation and better forest management. These actions are in part a response to the Bank's result-driven strategy of achieving specified development goals.

According to a recent World Bank's study[8]; "since initiating the reforms and open (market economy) policy, China has achieved tremendous overall success. Growth of about 9% per annum since the late 1970s has helped to lift several hundred million people out of absolute poverty, with the result that China alone accounted for over 75% of poverty reduction in the developing world over the last 20 years. Between 1990 and 2000 the number of people living

[6] For detailed summary and projections taken from the latest OECD Economic Outlook see: OECD Economic Outlook No. 81 - China Energy and Environmental Performance Review of China 2007, in OECD, Released: July 2007, pages: 336

[7] See: https://www.cia.gov/library/publications/the-world-factbook

[8] See: World Bank's China Economic Achievements and Current Challenges, 2007, p.1, www.external.worldbank.org

on a dollar per day fell by 170 million, while total population rose during this period by 125 million. Besides raising incomes, China's market-oriented reforms over the last two decades also dramatically improved the dynamism of both the rural and urban economies and resulted in substantial improvements in human development indicators. Official estimates of the adult illiteracy rate fell (..) from 37% in 1978 to less than 5% in 2002, and, indicative of health indices, the infant mortality rate fell from 41 per 1,000 live births in 1978 to 30 in 2002. Nevertheless, substantial challenges remain. More than 135 million Chinese, many in remote and resource-poor areas in the western and interior regions, still have consumption levels below a dollar per day, often without access to clean water, arable land, or adequate health and education services."

Millennium Development Goals

Eight broad development goals designed by the World Bank and the UN, which 192 member states set out to achieve by the year 2015, called Millennium Development Goals[9], or MDGs, range from halving extreme poverty to improving the global environment. The MDGs — in poverty reduction, education and other indicators to increase equity and ensure environmental sustainability—represent critical development targets. However, the MDGs do not, in themselves, illuminate the role of energy. China is on the right track to achieve many, but not all, of the MDG for 2015. National figures mask large and growing development gaps between the relatively rich coastal zones and poorer central and western regions. The following eight goals are:

1. Eradicate extreme poverty and hunger. National poverty reduction goals have been met. China leads East Asia, though the rate of reduction varies between rural and urban areas.

2. Universal primary education. China is ahead of target; junior secondary enrollment has also increased (from 67% in 1990 to 93.6% in 2004).

3. Promote gender equality and empower women. China is slightly off-track on the girl/boy ratio for primary and secondary school, but several provinces with large

[9] The World Bank's key activities focus on the reduction of global poverty, through the achievement of the Millennium Development Goals (MDGs) and the implementation of sustainable development.

minority populations have fallen behind and there are concerns over the situation of rural women and increasing margin of newborn boys over girls.

4. Reduce child mortality. China has made progress, but the 2% rate of reduction achieved in 1990s (using UN data) is lower than 4.3% rate required to achieve the target by 2015, and gaps between rich and poor provinces appear to be widening.

5. Improve maternal health. China has made good progress, as maternal mortality dropped from 89 per 100,000 live births in 1990 to 50 in 2001, but the 4.8% rate of reduction is lower than the 5.4% rate required to achieve the target by 2015. There are also large contrasts between coastal and western provinces, where women, especially in remote areas, have limited access to emergency obstetric care.

6. Combat HIV/AIDS, malaria, and other diseases. China has made good progress toward containing malaria, but it lags its neighbors in reducing tuberculosis prevalence (scaling-up and improving the detection rate remains challenging). China is also taking steps to reduce HIV prevalence, which is low by international standards but spreading rapidly since 1990s.

7. Ensure environmental sustainability. China is committed to reversing the degradation of land, water, air, alternative energy[10] and globally significant biodiversity. It is working hard to achieve challenging targets for access to safe drinking water and rural sanitation.

8. Develop a global partnership for development. China has expressed strong commitment and undertaken decisive action to integrate into the global economic system.

Now, almost halfway to a 2015 deadline, there has been progress towards implementing the Millennium Development Goals. Their overall success is however still far from assured. It

[10] The 11th Five-Year Program (2006-10), approved by the National People's Congress in March 2006, calls for a 20% reduction in energy consumption per unit of GDP by 2010 and an estimated 45% increase in GDP by 2010. The plan states that conserving resources and protecting the environment are basic goals, but it lacks details on the policies and reforms necessary to achieve these goals.

will depend in large part on whether developed countries make good on the concerted efforts of more targeted aid and improved institutional policy reflecting the specific needs of each country.

Increasing Energy Dependence

In keeping with China's changing needs, the emphasis of the Bank's support has shifted from financing large energy projects to focusing on assisting in managing the resource scarcity and environmental challenges of the energy sector. The Bank's specific energy sector strategy and objectives in China are:

(i) support the government efforts to implement energy efficiency policies and measures;
(ii) assist the government to harness clean energy, particularly renewable energy; and
(iii) mitigate the environmental impact of energy production and consumption, particularly coal.

The World Bank as a leading development institution provides not only funds for specific projects but also know-how, or knowledge to implement advanced and innovative technological solutions. One of the more important recent developments by the Bank was introducing in July 2005 at the Gleneagles Summit the G-8 Clean Energy Investment Framework. While the world mobilizes its scarce resources to reduce carbon emissions, the Bank helps countries deal with the effects of climate change, most of the resources, patents and investments have come from the developed countries, particularly the US. The World Bank is in a unique position to facilitate the investment flows and the Global Environment Facility (GEF) with the Clean Energy Investment Framework form the foundation of comprehensive development framework in renewable and alternative energy sources.

New Economic Plan

China's 11th Five Year Plan (2006-2010) forms the current basis for the Government economic and social development efforts. In continuity with the 10th Five Year Plan, the 11th Plan aims to sustain the rapid and steady development of China's "socialist market economy" while in addition achieving the "five balances" (between rural and urban development, interior

and coastal development, economic and social development, people and nature, and domestic and international development) and making economic and social development more people-oriented, comprehensive, balanced and sustainable.

The 11th Plan includes two key quantitative targets. First, it aims to achieve annual GDP growth of 7.5%, with the goal of doubling 2000 GDP per capita by 2010. Second, it aims to reduce energy consumption per unit of GDP by 20%, and the total discharge of major pollutants by 10%, by 2010. It also includes a number of strategic priorities and major tasks, including:

- rebalancing China's pattern of growth to improve regional and rural urban imbalances;
- deepening reforms and opening further to the outside world;
- constructing a "new socialist countryside;"
- promoting more balanced development among the different regions; and
- increasing the capacity for independent innovation.

To manage the resource demands and environmental consequences of rapid growth, China's leaders recognize the need to conserve scarce water resources, restrain energy consumption, and minimize environmental degradation. China already represents a 4% share of the world economy, and it has become a major source of demand for raw materials in the global markets (in 2004 it accounted for about half of global growth in metals demand and a third of global growth in oil demand, though it still accounts for only 8% of the oil market).[11] Currently, China's GDP is highly energy-intensive: it uses in the range of 50-100% more energy per unit of GDP than OECD countries for some industrial processes, and 20–100% more energy for residential heating and cooling than OECD countries with comparable climates. At the same time, water is increasingly scarce relative to China's needs, and the efficiency of water usage remains unsatisfactory, in part because water policy is inappropriate (urban water prices are kept artificially low, and thus discourage water conservation).

Reducing the energy intensity in China will require[12]:

[11] See World Energy Outlook 2007 at -- http://www.worldenergyoutlook.org/summaries2006/English.pdf
[12] For more elaborated discussion of this point see: China Switches on to Need for Energy Conservation, by Sawaji Osamu, in The Japan Journal, vol. 3, no 11. pp11-13, March 2007

- Pricing oil, gas, and electricity so that it takes into account environmental degradation costs and their impacts on welfare;
- Adopting higher standards of energy efficiency;
- Developing high-density cities with good public transportation; and
- Diversifying the sources of energy away from low-quality coal, including by investing in new technologies, such as fuel-cell, clean coal and renewables.

By taking action now, while China's urbanization and motorization are in the early stages, China will help to limit future demand and also improve the competitiveness of Chinese firms producing innovative energy- and water-saving technologies.

Climate Change Concerns[13]

With a rapidly growing coal-dependent economy, China has a critical role to play in the global efforts to address climate change. China is the second largest emitter of CO2 in the world (although per capita emissions are still just 1/4 of the average developed country level), and it could surpass the U.S., the current leader, by 2030. The main cause is coal consumption, which causes 80% of China's green-house gas (GHG) emissions as well as widespread air pollution and acid rain. With its long coastline and vast expanses of arid and semi-arid land, China is also vulnerable to the adverse impacts of climate change, which could intensify water shortages in northern China, increase the incidence of extreme temperature events and consequent flooding and droughts, and reduce the yields of major crops. The sheer geographical size and speed of China's economic growth suggest that China cannot follow traditional growth patterns and must adopt proactive energy policies to avoid potentially large risks of elevated health and environmental damage and energy supply disruptions which could undermine China's long-term goal of becoming a prosperous and harmonious society.

China has been making significant efforts to reform the energy sector and support the adoption of energy-efficient and renewable energy technologies.[14] For the 11th Five Year Plan,

[13] One of the more comprehensive and useful resource on climate change can be found at -- http://www.developmentgateway.org/

[14] China will need to be proactive in reducing climate vulnerability. Recent analyses by staff at the World Bank, the OECD, and the Inter- American Development Bank suggest that up to 40 percent of public finance – or some $40

China has pledged to improve energy efficiency by 20% and meet 10% of its energy needs from renewables by 2020. Yet many of China's interventions in the energy sector have been reactive and incremental, due to concerns about supply disruptions and high financial costs. With the goal of quadrupling the economy between 2000 and 2020, China still has many opportunities to address climate change[15] through vigorously adopting low-carbon energy options for new investment over the next decade, during which two-thirds of the 2020 economy will be built. As the world's largest developing economy, with substantial and growing market power, China could become a world leader in using advanced thermal and large-scale renewable energy technologies; setting energy efficiency standards for buildings, manufacturing, and automobiles; and creating an efficient urban and public transportation network. Because China will continue to rely on coal in the near term, China also needs to promote low-impact coal mining and utilization technologies and accelerate afforestation and reforestation programs to support carbon sequestration. A proactive policy response of this kind would generate large national benefits by improving air quality and mitigating climate change damage to human health and the environment.

The Bank Group, in close partnership with China, is engaged in a range of areas directly relevant to climate change. Reducing China's reliance on coal has been a major theme of the Group's policy dialogue and has been supported by the Bank on improving energy efficiency, increasing the use of natural gas, and scaling-up the renewable energy market. The Bank has also helped to formulate the recently passed China Renewable Energy Law, assess opportunities for participation in the Clean Development Mechanism [16](CDM) market, design the policy and institutional framework for CDM market development, and establish and capitalize the Clean Development Fund (CDF).

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billion per year is subject to climate risk, and only a small portion takes this risk into account in project planning. As much as 40 percent of Bank projects are estimated to be climate sensitive. The initial challenge is to raise funds to significantly increase the knowledge base in order to design and implement appropriate adaptation strategies.

[15] Climate is a global public good**.** Because of the recognition of common responsibilities in the United Nations Framework Convention on Climate Change (UNFCCC) and because the industrialized countries are responsible for most of greenhouse gases (GHG) currently in the atmosphere, developing countries are not expected to bear the additional costs of a low-carbon economy. There are only three sources of funding for mitigating greenhouse gas emissions: voluntary actions, international grants, and trade. While all are potentially important, trade is likely to confer the biggest flow of funds (between $20 and $120 billion per year).

[16] China has strong potential in GHG emission reduction, and has many projects awaiting investors in the fields of renewable energy, new energy and the recycling of methane and coal gas. It is estimated, before 2010, some US$3-5 billion trade related to CDM around the world will come from China, according to the World Bank. If China seizes the opportunities, the total investment involved in CDM is expected to reach US$15-20 billion from 2008 to 2012.

In January 2006, the Bank and China identified several areas for deepening their partnership on climate change including strengthening policy; strengthening the enabling environment for CDM projects; transfer and application of low-carbon technologies; and facilitating knowledge transfer and research on climate change impacts and adaptation in technologies.

Renewable Energy

Last Fiscal Year (2006) the World Bank has exceeded its commitments to renewable energy by 48 percent, when it announced that close to three-fourths of the billion was committed to new renewable energy projects.[17] The total amount of funds committed for renewable energy and energy efficiency programs in 2006 was US$871 million. Commitments for renewable energy and energy efficiency were 37 percent of total power sector commitments and 20 percent of Bank total energy sector commitments in fiscal year 2006, which reached $4.4 billion. In fiscal year 2006, the Bank supported 62 such projects in 35 countries worldwide. Between 2000 and 2005 alone, China was responsible for about one quarter of the growth in world oil demand, but only accounted for less than 8 percent of global consumption. However, imports are projected to account for 60–80% of China's oil consumption by 2020.

Renewable energy has proven to be undoubtedly beneficial, but mandating, rather than providing greater incentives for utilities and industrial customers to leverage opportunities. Alternative resources moreover are by nature complementary rather than fungible toward increasingly higher energy requirements. According to the US Department of Energy, America could supply its entire energy needs by covering a mere 1.6% of its land area with solar cells. Wind and solar energy already play an important part in a few countries. For example, around 20% of Denmark's electricity comes from wind and about 80% of China's hot water from solar energy. But worldwide those two energy sources barely register.

Solar photovoltaic power has grown by an average of 41% a year over the past three years; wind has grown by 18% a year. The supply side offers part of the explanation. During the wind boom of the 1970s turbine blades were around 5-10 meters long, and turbines produced no

[17] Main renewable energy technologies include wind power, water power, solar energy use, biofuel, liquid biofuel, solid biomass, biogas and geothermal energy.

more than 200-300kW of energy each. The energy they produced cost around $2 per kWh. Now the blades are up to 40 meters long and turbines produce up to 2.5MW each at a cost of 5-8 cents per kWh, depending on location (coal-fired electricity, depending on the plant, costs 2-4 cents per kWh). And there are already 5MW prototypes in existence, with 62-metre blades. Similarly is the case with solar photovoltaic cells. The efficiency with which they convert sunlight to electricity has increased from 6% when they were first developed to 15% now. Their cost has dropped from around $20 per watt of production capacity in the 1970s to $2.70 in 2004, though a silicon shortage has pushed prices up since.

Governments are using sticks as well as carrots to push investment in renewables, requiring a proportion of the energy sold to come from renewable sources. In America, for instance, 21 states have renewable portfolio standards requiring a certain proportion of power sold--20% by 2017 in California, for instance--to come from renewable sources. But it is in China that government fiat is having the most dramatic effect. The country currently meets 7.7% of its energy needs from renewable sources (including large-scale hydro)[18]. In 2005 it announced that the figure would rise to 15% by 2020. That has led to a huge rise in demand for wind turbines.

Bio fuels, especially cellulosic ethanol, hold great promise and deserve continued investment in research and development, but rapidly accelerating corn-based ethanol requirements at this time is simply a mistake. Beyond an inability to transport corn-based ethanol nationally, significant issues remain with respect to the actual energy efficiency gained, the impact on food, livestock feed and natural gas prices, lingering environmental implications and the unique production requirements that would result from mandates now wrongly being offered as a silver bullet solution. China's environment is deteriorating, adversely affecting its economy and overall quality of life. In its frantic push for growth, China has chosen short-term economic development over environmental preservation, and as a result, air and water quality have been compromised. Energy has become a defining dimension of this goal. China's per capita energy use is only a ninth that of the United States, but its huge population and low energy efficiency

[18] In the developing world, between now and 2030, non-hydro renewable energy is projected to grow at an estimated 5.7 percent per year. By contrast, in the developed world, between now and 2030, non-hydro renewable energy is projected to grow an estimated 3.1 percent per year.

means that China is already the second-biggest energy consumer in the world. China uses nine times more energy than Japan to produce a dollar of gross domestic product.

Conclusion

The purpose of this paper was to take stock of where China is and where it is headed, surveying China's growing impact on the world's economy. China's economic progress over the past three decades has been without a doubt very impressive. The Chinese people today enjoy a higher economic standard of living and China's rapid economic growth is likely to continue.[19] The same cannot be said however regarding personal, political and religious freedoms, which even though they go beyond the scope of this paper, need nevertheless to be pointed out.

China is grappling with its new role as a major importer of oil. The country's loss of self sufficiency, substantial increase in the volume and cost of its oil imports after the turn of the century, and its emergence as an important factor in the world oil market and accompanying international scrutiny all caught China's leaders by surprise. For the past decade, Beijing has been struggling to cope with the domestic and foreign consequences of rapid demand growth. China – though it is becoming a formidable financial power house with budget surplus of 1.3 trillion US$ - is not a rival institution to the World Bank. The Bank represents the collaborative efforts of the world community to help the developing countries, of which China is still undisputed member.

The government's efforts to meet China's energy requirements are in a state of flux as it faces policy and management challenges.[20] The energy crisis of 2003/04—when widespread electricity shortages plagued the country and oil demand surged—highlighted the deficiencies in China's energy policymaking apparatus, which is characterized by ineffective institutions, coterie, corruption and vested interests. Poor coordination of the conflicting objectives of

[19] Nicholas R. Lardy, ''China: Toward a Consumption-Driven Growth Path,'' Institute for International Economics Policy Brief, October 2006, available at www.iie.org and also, http://www.petersoninstitute.org/publications. http://usinfo.state.gov/xarchives

[20] China will need nearly $2 trillion in electricity investment over the next three decades. China is already experiencing power outages from rapid growth. Energy investment as a percentage of GDP is already much higher in the developing countries than in OECD countries. The average investment in OECD countries is less than 1 percent of GDP; China will need to spend more than 2 percent of GDP.

different components of the bureaucracy and tensions between the government and the state-owned energy companies hindered development of a comprehensive national energy strategy.

At the 2004 International Conference on Renewable Energies in Bonn, Germany, the World Bank Group committed to a target of a 20 percent average annual growth in new-renewable energy (solar, wind, biomass, geothermal, as well as hydro up to 10 MW in capacity) and energy efficiency commitments between fiscal years 2005 to 2009. The World Bank Group's work on renewable energy (RE) and energy efficiency includes the China Renewable Energy Scale-up Program, which helps to finance RE investments, build capacity, and implement China's Renewable Energy Law.

China must speed up access to renewable energy sources to increase productivity, enhance competitiveness, and thus make economic growth sustainable. Without access to modern and sustainable energy people are deprived of energy services, which provide lighting, cooking, heating, refrigeration, transportation, motive power, and electronic communication that are indispensable to creating enterprises, employment, and incomes.