China's clean revolution

Summary Report

THE CLIMATE GROUP

Foreword
Steve Howard & Changhua Wu

This report is based on research conducted by The Climate Group's team in China. Its findings show that far from ignoring climate change, Chinese government and business leaders are now acutely aware of both the dangers and opportunities this environmental challenge brings. Even more importantly, it shows that significant actions to improve energy efficiency are already underway. China is now showing some of the strongest growth rates in the 'low carbon' industries that reduce climate impacts of any country in the world and is creating jobs and generating profits in the process.

Many governments, businesses and even individuals have been wary of committing to action on climate change when they perceive that China – the world's largest greenhouse gas emitter – seems to be doing little to address the issue. To illustrate the challenge, if China continues to increase greenhouse gas emissions at the 2007 rate of 8% per annum and if the European Union continues towards its target of a 20% emission reduction, China's per capita emissions will be double those of Europeans by 2020.[1] Even China's goal to double renewable energy to 15% of total generation by 2020 will be overshadowed by a projected doubling in overall energy demand during the same period.[2]

But focusing on projections like this can be misleading. This report shows that significant changes are already occurring in China which present the real possibility of the country's transformation into a global 'low carbon leader', that is, a nation at the forefront of developing policies, strategies and technologies that reduce emissions of carbon dioxide and other greenhouse gases that contribute to climate change. Evidence is mounting of a trend towards stronger action and more ambitious targets. The demonstrated pace of change is also quickening – China is ahead of schedule to meet its renewable energy goals while, by comparison, progress in the UK has faltered.[3] Nevertheless, the litmus test for China's low carbon learning curve will be whether it can contribute to two major milestones that the science tells us are required to avert dangerous climate change: firstly, a peak in global emissions by 2020; and secondly, progress towards a global 2050 emissions goal of two metric tons CO_2 per capita.[4] In 2007, China reached a per capita level of 5.1 metric tons compared to the European Union's 8.6 metric tons and the USA's 19.4 metric tons.[5]

60%

China has reduced the energy intensity of GDP by over 60% since 1980, and has set a target to reduce it by a further 20% by 2010.

The jury is still out on whether China and other countries can reach these challenging targets, but the evidence contained in these pages shows that China has already started on a trajectory towards becoming an important global hub for low carbon investment, innovation and growth in coming decades. China's leaders have shown competence at engineering China's 'economic miracle' over the last three decades and, more recently, skill at confronting major short-term challenges such as the tragic May 12, 2008 earthquake in Sichuan. The fact that the country's leadership is now putting a focus on climate change, creating greater than expected movement in renewable and alternative energy technology sectors, gives us great hope that China could achieve a second miracle 30 years from now by moving to a low carbon economy. But, this time, we believe that China will no longer be a developing country following where others have led, but a pioneer leading the way.

Steve Howard: CEO, The Climate Group
Changhua Wu: Greater China Director, The Climate Group

"In the move to a low carbon economy, we believe that China will no longer be a developing country following where others have led, but a pioneer leading the way."

Steve Howard: CEO, The Climate Group
Changhua Wu: Greater China Director, The Climate Group

Executive Summary

China has made significant progress in practically every low carbon economic sector in recent years and has already become a leader in a number of critical renewable energy markets. This report chronicles the rapid growth of low carbon industries and policies in China and turns the spotlight on several leading innovators. The evidence gathered here suggests that China not only has potential to become one of the largest forces in low carbon development, but that in various industries and according to a several key metrics, China is already leading, generating jobs and profits along the way.

China's important role in solving the climate change challenge

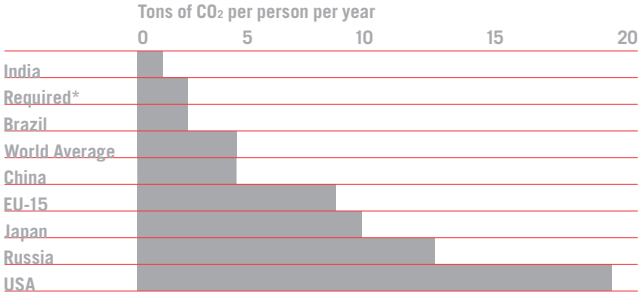
It has been widely reported in the media that China has become the largest national emitter of carbon dioxide (CO_2), a potent global warming gas, and that the country is and will continue to be one of the most important players in finding a solution to the climate change challenge.[1] Scientists have pointed out that in the period before 2002, when over 90% of human carbon emissions were released, China accounted for only 7% of the global total, compared to 26% and 29% for the European Union and United States respectively.[2] But since the turn of the century, the proportion of emissions from China has been growing steadily and it now accounts for over 24% of the annual total, a figure which is growing every year.

15BN

China is a leading manufacturer of solar photovoltaics and leading domestic solar companies have a combined market value of over US$15 billion.

Although China has a population of over 1.3 billion people, CO_2 emissions per person are relatively low. If China's citizens emitted as much CO_2 as America's, China's total emissions would be roughly equivalent to those of the entire planet today. A recent report by Sir Nicholas Stern and the London School of Economics proposed a target of two metric tons of CO_2 per person per year for all countries by 2050.[3] From this perspective, while China's carbon intensity per person is barely above the world average, it is still far above where it needs to be by mid-century.

Per Capita Carbon Dioxide Emissions[1]
for Selected Countries in 2006



*Required world average per capita emissions by 2050 to keep atmospheric carbon dioxide concentration below 500ppm

When considering progress towards a low carbon economy, the well-known Chinese proverb comes to mind – a journey of ten thousand miles begins with a single step. By bringing together data in four key sectors – power, energy efficiency, transport and finance – this report highlights those steps China has already taken on the road towards a clean, green future. The headline findings are listed below and these challenge the perception of China's inaction on greenhouse gas emissions. They also demonstrate the scale of the opportunity for the Chinese economy associated with emerging low carbon markets.

Renewables investment and installed capacity are growing quickly

According to the *Renewables 2007 Global Status Report*,[4] China is already the leading renewable energy producer in terms of installed generating capacity, with the largest hydro-electric fleet and fifth largest wind power fleet in the world. China plans to almost double the proportion of renewable energy it uses from 8% in 2006 to 15% in 2020, with concrete targets for hydro power capacity at 300 Gigawatts (GW), bioenergy power at 30 GW, wind power at 30 GW, and solar power at 1.8 GW.[5] The country's renewable energy targets are close behind those of the most advanced countries such as those of the European Union which have set a renewable energy target of 20% by 2020.[6]

China ranked second for the absolute dollar amount invested in renewable energy in 2007 with over US$12 billion, trailing the leader Germany which invested US$14 billion.[7] The nominal sizes of the Chinese and German economies were almost equal at US$3.3 trillion in 2007,[8] meaning that China trails leader Germany only slightly in renewable energy investment as a percentage of GDP. New Energy Finance predicts that another US$398 billion of investment is needed to reach China's 2020 renewable energy goals, or an average of US$33 billion per year mainly for wind, biomass, hydro and solar installations.[9]

China is or will soon be the No.1 manufacturer of various critical low carbon technologies

China is currently a leading manufacturer of solar photovoltaic technology, with 820 Megawatts of production by the end of 2007, second only to Japan.[10] The country is set to capitalise on this growing export opportunity as the world transitions to a low carbon future.

In addition to China's own local wind power installations which grew by around 120% in 2007, the Global Wind Energy Council announced in early 2008 that China will become the world's leading exporter of wind turbines by 2009.[11]

China is also competing for or taking the lead in the production of other critical renewable and low carbon technologies such as solar water heaters (holding 60% of the global market), energy efficient home appliances and rechargeable batteries.[12]

China is a leader in developing low carbon transport technologies

Beyond its traditional reliance on bicycles and public transport, China is now introducing measures to limit

oil consumption from its growing motor vehicle fleet, implementing fuel efficiency standards for cars 40% higher than those in the USA, although still lagging behind those in Europe and Japan.[13] China has also succeeded in scaling up a range of low carbon transport technologies; over 21 million electric bicycles and 1.64 million energy efficient compact cars were sold in 2007, and domestic hybrid and electric vehicle technologies are progressing rapidly.[14]

Biofuels also feature strongly, with China being the third largest ethanol producer in the world.[15] The country has begun converting an area of marginal land half the size of the United Kingdom into biofuel forests, hopefully easing the competition between biofuels and grain crops that has contributed to food price increases.[16] There are plans to produce 12 million metric tons of low carbon fuel per year by 2020.

China is making successful efforts to reduce carbon intensity
The energy intensity of the Chinese economy has dropped by over 60%[17] since 1980. Moreover, China has targeted a further 20% reduction between 2006 and 2010.[18]

Fossil fuels still provide 80% of China's power, but by replacing small and inefficient power stations with high efficiency super-critical technology, China hopes to avoid approximately 37.6 million metric tons of CO_2 emissions every year.[19]

The Chinese Government has also put in place an ambitious monitoring, benchmarking and control system for China's 1,000 largest energy consuming companies, between them responsible for 33% of national energy usage. The programme stipulates that these companies must reduce their energy intensity to accomplish an overall energy saving of 100 million metric ton standard coal equivalent[20] (over 833 million Megawatt-hours) by 2010.

A strong and comprehensive low carbon policy framework is in place
In addition to the overarching 20% energy intensity reduction target and the 15% renewable energy target, a comprehensive set of complementary regulations have been developed covering almost every sector of China's economy.

Fuel economy standards (see above) were issued in 2005; one of the world's most comprehensive mandatory energy efficiency testing and labelling standards for home appliances was implemented the same year;[21] a tax of up to 20% on gas guzzling SUVs was introduced in 2006 while compact cars are only taxed at 3%; strict building efficiency design codes have been introduced which will cut energy consumption of new buildings by 50%; and China's Renewable Energy Law, which also came into effect in 2006, mandates that the power grid purchase renewable power, giving subsidies for wind and biopower projects.

12BN

Investment in renewable energy in China, at almost US$12 billion in 2007, is almost level with world leader Germany as a % of GDP. In terms of installed capacity, China leads the world, reaching 151 GW by the end of 2007.

Chinese entrepreneurs are riding a low carbon wave
A low carbon wave has swept up literally tens of thousands of Chinese companies into new markets and created some of China's most successful business leaders. For example, China's six largest solar photovoltaics (PV)manufacturers, most of which did not exist 10 years ago, had a total market value of over US$15 billion by July 2008.[22] Some other rapidly growing areas are: the solar water heater market, which employs over 600,000 people in China, is worth over US$2 billion per year and is growing at 20% annually;[23] the energy efficient compact car market, which was worth over US$50 billion in 2007; the electric bicycle market, which was worth over US$6 billion in 2007;[24] and China's leading wind turbine manufacturer, which has a rapidly rising market value of over US$6 billion.[25]

Across power, efficiency and transport, China has frequently taken the route followed by most countries focusing policies on new buildings, factories, vehicles or products, instead of replacing or retrofitting old ones, which is a more complicated and expensive approach. For this reason it will take several years to see the full effect of the initiatives which have been introduced. Many opportunities still exist for China to further speed up the phase out of older technologies.

Another qualifying factor, when considering the data presented in this report, is level of implementation. It is inevitable that some companies will evade the system. However it's clear improvement in energy intensity to this point indicates that China has been as successful in overcoming resistance to new efficiency policies as any country. For example, China's energy intensity[26] has recently shown two consecutive drops, of 1.79% in 2006 and 3.66% in 2007.[27] As more Chinese companies and products begin to comply with the new regulation, China will face the continuing challenge of monitoring and ensuring compliance, encouraging innovation and continually pushing up standards to best-available technology.

Unleashing China's low carbon potential

With companies fielding strong investment, reaping impressive profits and seeing double or even triple digit growth in low carbon sectors, China and its new generation of low carbon entrepreneurs are already seeing significant economic benefits as a result of their push into the low carbon economy.

Last year, The Climate Group's *In The Black* report documented how, even in the absence of consistent policy, the low carbon economy is booming in four major industrialised countries. What this latest report shows is that this is not just a niche market for rich countries, but rather that – with their cost advantages and abundant abatement opportunities – investment in low carbon solutions can be equally, if not more profitable, job-creating and socially beneficial in developing nations.

China in particular has embraced this opportunity, once again showing that moving to a low carbon economy is consistent with growth, development and energy security objectives.

China is showing that moving to a low carbon economy is consistent with growth, development and energy security objectives.

Sources

Foreword

1 – Calculated from per capita CO_2 emissions data from the Netherlands Environmental Assessment Agency. In this scenario, China's per capita CO_2 emissions increase from 5.6 metric tons in 2007 to 12.6 metric tons in 2020; EU-15 per capita CO_2 emissions decrease from 8.6 metric tons to 6.1 metric tons in the same period.
2 – International Energy Agency, *World Energy Outlook 2006*, http://www.worldenergyoutlook.org/2006.asp
3 – Martinot, Eric and Li Junfeng, *Powering China's Development: The Role of Renewable Energy* (Worldwatch Institute, November 2007); UK House of Commons Innovation, Universities, Science and Skills Committee, *Renewable electricity generation Technologies Fifth Report of Session 2007–08 Volume I*, 11 June 2008, http://www.publications.parliament.uk/pa/cm200708/cmselect/cmdius/216/216.pdf
4 – As set out by Nicholas Stern in *Key Elements of a Global Deal on Climate Change* London School of Economics, April 2008
5 – Netherlands Environmental Assessment Agency

Executive Summary

1 – Lewis, Joanna I., *China's Strategic Priorities in International Climate Negotiations* (Washington Quarterly, Winter 2007-8) 31:1 pp. 155–174, http://www.twq.com/08winter/docs/08winter_lewis.pdf
2 – World Resources Institute, *Navigating the Numbers: Greenhouse Gas Data and International Climate Policy* (2005), http://pdf.wri.org/navigating_numbers.pdf
3 – Stern, Nicholas, *Key Elements of a Global Deal on Climate Change* (London School of Economics, April 2008) http://www.lse.ac.uk/collections/granthamInstitute/publications/KeyElementsOfAGlobalDeal_30Apr08.pdf
4 – Renewable Energy Policy Network for the 21st Century (REN21), Renewables 2007 Global Status Report, 2008, www.ren21.net/pdf/RE2007_Global_Status_Report.pdf
5 – China's Medium- and Long-term Program for Renewable Energy Development, 2007
6 – Announcement made at the EU Spring Summit, Brussels, March 2007
7 – REN21, *Renewables 2007 Global Status Report* (2008)
8 – International Monetary Fund data, 2007
9 – New Energy Finance, Interesting Times 2.0 – Second Focus Report on Clean Energy *Investment Opportunities in China* (January 2008) http://www.newenergyfinance.com/?n=19
10 – Sawin, Janet, *Another Sunny Year for Solar Power*, Worldwatch Institute, May 2008
11 – Global Wind Energy Council, *Global Wind 2007 Report* (January 2008)
12 – Business Week, *China's Plucky Plug-in Hybrid* (January 2008); US News and World Report, *China's Renewal: Hungry for fuel, it emerges as a leader in renewable energy* (June 2006)
13 – International Council on Clean Transportation (ICCT), *Passenger Vehicle Greenhouse Gas and Fuel Economy Standards: A Global Update* (2007)
14 – China Electric Bicycle Business Info Net (in Chinese), www.ddc.net.cn; China Auto News (in Chinese), *Overall Profitability Improves, Rapid Growth in China Auto Market in 2007* (January 2008), http://www.qiche.com.cn/files/200801 /16016.shtml
15 – Green Car Congress, *China Targeting Growing Biofuels 12x by 2020* (August 2006)
16 – China Daily, *Forests Help Absorb Carbon Dioxide* (June 2007); Xinhua News Agency, *China to Offer Support Policies for Non-food Biofuels* (December 2007)
17 – Standard Coal Equivalent consumption per 10,000 Yuan (approximately US$1,450) GDP", was reduced from 3.39 metric ton in 1980 to 1.21 metric ton in 2005 (calculated using the 2005 constant price) – a reduction of 63%
18 – Target contained in the Chinese National Development and Reform Commission (NDRC), 11th 5 Year Plan for 2006-2010, 2005
19 – Chinese NDRC, January 2008, http://nyj.ndrc.gov.cn/sdyx/t20080203_190031.htm
20 – Program of Energy Conservation among 1000 Enterprises, NDRC, 2006
21 – Fridley, David, Nathaniel Aden, Nan Zhou and Jiang Lin, *Impacts of China's current Appliance Standards and Labeling Program to 2020*, The Collaborative Labeling And Appliance Standards Program, Lawrence Berkeley National Laboratory, Environmental Energy Technologies Division, March 2007, http://www.osti.gov/bridge/servlets/purl/920173-qvrmdX/920173.PDF
22 – Data source: Google Finance.
23 – Renewable Energy World, *Powering China's Development: The Role of Renewable Energy* (March 2008)
24 – Financial Post, *China Market Powers Growth for Electric Bike Manufacturer* (March 2008)
25 – Goldwind Science and Technology Company, market value as quoted by Google Finance in March 2008
26 – Measured by ton Standard Coal Equivalent per 10,000 RMB of GDP.
27 – Statistical Communiqué for Each Province (Autonomous Region, Municipality) on Energy Consumption per GDP in 2007, 14, July 2008.

Charts

1 – Calculated from data in the *BP Statistical Energy Review* (2007); required value taken from *Nicholas Stern, Key Elements of a Global Climate Deal* (2008)

Acknowledgements

About THE °CLIMATE GROUP
The Climate Group is an independent, not-for-profit organisation that works internationally with government and business leaders to advance climate change solutions and accelerate a low carbon economy. Its coalition of proactive leaders – from government, business and civil society – has demonstrated that emissions reductions, essential to stop climate change, can be achieved while boosting profitability and competitiveness. More companies, states, regions and cities around the world are realising there are significant economic as well as environmental advantages from taking decisive action now. The Climate Group was founded in 2004 and has offices in the UK, USA, China, India and Australia. A mainland European office is planned for 2008.

The Climate Group would also like to thank Thor Björgólfsson for his continued support.

THE °CLIMATE GROUP

Head Office:
The Tower Building
3rd Floor
11 York Road
London SE1 7NX
United Kingdom

T: +44 (0)20 7960 2970
F: +44 (0)20 7960 2971

Greater China – Beijing
Suite 1502 Golden Tower
1 Xibahe South Road, Chaoyang District
Beijing
China
100028

T: +86 (10) 6440 3639

USA – New York
444 Park Avenue South
Second Floor
New York
NY 10016
USA

T: +1 (646) 233 0550
F: +1 (646) 861 4606

Australia
Level 39 Rialto, 525 Collins Street
Melbourne
VIC 3000
Australia

T: +61 (3) 9617 4329
F: +61 (3) 9614 2103

WWW.THECLIMATEGROUP.ORG