(Abstract: *Climate Change is spawning quite a few unexpected Green Swans across the globe. China is taking the lead in going Green to avert the Clear and Present Danger of Energy, Food and Climate Security. The supply and transportation of energy and other scare resources worldwide are re-shaping global geopolitics and geo-economics. The world is just beginning to grasp the many fascinating challenges and opportunities.)*

The Green Swans of Climate Change

Only days before Copenhagen, China announced a massive 40-45% cut by 2020 from the 2005 base-line carbon intensity (per unit GDP). The world was pleasantly surprised. The Chinese target stands in stark contrast to the US announcement the day before of only 17 %. Given the substantial differences between and within developed and developing countries, whether Copenhagen will prove to be a truly epoch-defining moment remains to be seen.

China's concept of Sustainable Development is holistic: Economic Development and Poverty Reduction not to be forgotten on the altar of Conservation. The US is unlikely to sacrifice her consumption and energy-intensive lifestyle any time soon. Nevertheless, energy and climate security bind the world's two largest energy users and polluters closer together than many people may think.

New York Times columnist Thomas Friedman has highlighted an emerging alliance between environmentalism and concerns about Energy Security. In the same vein, the Pentagon has helped fund a major study on how greater fuel efficiency, lightweight car materials, advanced biofuels, and other technologies can help win the Oil End Game (1).

In the West, people talk about Climate Change mostly in terms of a looming risk, threatening trees and polar bears, for themselves, their children and children's children, not to mention the considerable body of skeptical scientists and economists. For China, however, Climate Change is Clear and Present Danger. Important it is that pollution chokes people's lives and livelihood, threatening food security and social stability. What is more, energy is the life-blood for China's breathless industrialization and urbanization, to generate some 15-20 million additional jobs a year for the country to stay even. This remains at risk as she needs to import a great deal of fossil energy from the world's most troublesome areas, passing through geopolitically sensitive sea-lanes such as the Straits of Hormuz (near Iran) and Malacca (controlled by US 7th Fleet). Reducing dependence on fossil fuels will therefore mean more than blue skies and clean lakes.

It should therefore come as no surprise that notwithstanding their differences, both the US and China are serious in signing a US-China Clean Energy Agreement during President Obama's visit to Beijing (2).

China's positive stance on Climate Change is by no means a sudden volte face. Granted, the specific targets of emission reduction by 10% and energy intensity by 20% in the Five Year Plan 2006-2010 represented a watershed. But they were underpinned by an *Agenda 21 White Paper on Population, Environment and Development in the 21st Century*, drawn up in response to the UN Framework Convention on Climate Change (UNFCC) in 1992. They were likewise supported by findings in a 400-page multi-departmental *National Assessment Report on Climate Chaos*, published in December 2006. On 16th March, 2007, Premier Wen Jiabao categorically stated that China's current development was becoming 'unstable, unbalanced, uncoordinated, and unsustainable' (3). Immediately after the Beijing Olympics, President Hu Jiantao signed into law China's first-ever 'Recycling Economy' legislation, to take effect on 1 January, 2009.

Apart from China, the energy dimension of Climate Change is precipitating a paradigm shift in the geopolitics and geo-economics across the globe as energy-rich countries like Russia and those in the Middle East are on the ascendancy. Energy and other scarce resources have become the name of the game in the Middle East, Central Asia, Africa, Latin America and Australia as they fuel the rampant market economies which billions in the world's newly industrializing countries are embracing with a vengeance (4).

China is poised to lead in creating a low-carbon economy. The adoption of hydro, solar, wind, nuclear, coal-seam gas, biomass, geothermal, wave and other renewable energies is being actively encouraged across the provinces. As I write, China is building the world's largest wind farm in Gansu Province at a cost of $17.6 billion. It will have an installed capacity of 20 GW by 2020, with an eventual capacity of 40 GW (5). China is leading the world in hydro-electric power, accounting for 5.9% of total energy production. Over two-thirds of China's land area has 2,200 hours of solar radiation annually, especially in the western provinces of Inner Mongolia, Xinjiang and Yunnan. Installed photovoltaic capacity is expected to reach 20GW by 2020, up from only about 0.07GW in 2005 (6). The International Energy Agency (IEA) estimates that China will be investing $200 billion for renewable energy until 2020 when China hopes to achieve 15% of total needs from renewables. The country is expected to become the world's largest renewable energy market, including technologies, low-carbon innovations and products as well as carbon exchange (7).

Strategy consultants Roland Berger have estimated a global market for environmental technologies totaling 1.21 trillion euros in 2005 (8). Although green investments are losing steam in the wake of the global financial crisis, the business opportunities will begin to look more enticing as confidence and credit return to the markets and in the follow-up of Copenhagen. A powerful catalyst for the revival of green investments worldwide is likely to be green cars. GM has invested more than $1 billion in the development of hydrogen fuel-cell electric cars in partnership with Shanghai to develop a prototype and supporting infrastructure. The development of advanced technologies in micro-power, energy-storage and smart power grids will help set the stage to spawn a whole new generation of green vehicles. These will not only extricate the world from over-dependence on Oil but also promise to revolutionize the cars we drive in the Future (9).

China is building the world's first Eco-City at Dongtan on Chiongming Island, 15 km north of Shanghai, with the help of Ove Arup and Partners. With a planned population of half a million, it originally hoped to open for an initial intake of citizens by 2010, to coincide with the opening of the Shanghai World Expo, although this is now likely to be delayed. However, more of these eco-cities, towns and villages are on the cards in China, where some 350 million more people are estimated to live in new urban communities in mankind's largest and fastest urbanization drive in the coming decades (10)

In the longer term, the End Game could well take on unexpected dimensions. A study by the University of Iceland (11) shows how the momentum of global warming may tilt the balance of the world's economic gravity from the Asia Pacific towards the Artic. Over the next few decades, the melting of Artic ice is set to open up much shorter shipping lanes connecting the North Pacific with the North Atlantic through the Bering Straits and the Canadian archipelago. This may diminish the prominence of Asia's container ports, currently 8 out of the world's top ten (12). In addition, the Artic's cornucopia of oil, gas and mineral deposits will benefit those countries able to stake territorial claims, including Russia, the Nordics, the US and Canada, but not those in Asia.

The realities of Climate Change in terms of Energy, Food and Climate Security have spawned quite a few Green Swans lurking in the vicinity and in the more distant horizons. China's quiet yet vigorous embrace of the Green Revolution is particularly eye-catching. The world is only just beginning to grasp the many unexpected challenges and opportunities.

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(1) Amory Lovins, *Winnng the Oil Endgame*, Rocky Mountain Institute, 2004
(2) The US-China Clean Energy Cooperation Agreement, signed on 17 November 2009, provides for (a) a US-china Clean Energy Research Center, (b) a US-China Electric Vehicle Initiative, (c) US- China Energy Efficiency Action Plan, (d) US-China Renewable Energy Partnership, (e) US-China 21st Century Clean Coal Projects (f) US-China Shale Gas Initiative and (g) a US-China Public-Private Partnership Energy Cooperation Program
(3) Premier Wen made the remark at the press conference of the Fifth Session of the 10th National People's Congress
(4) Clyde Prestowitz, *Three Billion New Capitalists:The Great Shift of Wealth and Power to the East*, 2005, Basic Books
(5) See http://thebreakthrough.org/blog/2009/07/with_176b_project_china_surges.shtml
(6) Ryan Rutkowski, Asia Times Online, 2 December 2009
(7) *A Special Report on Climate Change*, The Economist, 5 December, 2009, pages 18-20
(8) Roland Berger, 2006. The global market (in billion euros) for environmental technologies is composed of (a) 450 for Energy Efficiency, (b) 290 for Sustainable Water Management , (c) 190 for Renewable Energy Generation, (d) 170 for Sustainable Mobility, (e) 90 for Natural Resources and Material Efficiency, and (f) 20 for Recycling Management
(9) Iain Carson & Vijay V Vaitheeswaran, *Zoom: The Global Race to Fuel the Car of the Future*, 2007, Twelve, Hachette Book Group, USA
(10) China is expected to put another 350 million people in cities by 2025 (*Preparing for China's Urban Billion*, Mckinsey Global Institute, March 2008)
(11) Trausti Valsson, *How the world will change with Global Warming*, University of Iceland Press, 2006
(12) In September 2009 Alphaliner, a leading international shipping information platform, listed the following as the world's top ten container ports: Singapore, Shanghai, Hong Kong, Shenzhen, Busan, Los Angeles, Dubai, Qingdao, Guangzhou, Ningbo, pushing Rotterdam to 11th place.

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