

**Andrew Leung International Consultants Ltd**

# **China's 'Green Revolution'**

*Andrew K P Leung, SBS, FRSA*

*A presentation at*

*St George's House, Windsor Castle, Windsor, United Kingdom*

*Friday, 27 March, 2009*

# Guess What?

- (a) Most of the beautiful scenic (lake) was hopelessly polluted by the so-called red-tides of **polluted waters from the factories on its shores**. Smog warning became regular and asthma sufferers began trekking to the hospitals. Regional complaints and petitions about pollution, about 20,000 five years (earlier), had risen to 76,000 as this decade began. In the south, **hundreds of people fell ill from eating the local fish. Many died**. Similar problems occurred in the north, with **mercury-filled drainage** from one factory and where a painful bone disease was caused by cadmium .....



- (b) For two decades, the government treated **environmental protection as a distraction from economic growth**.....Breakneck industrialization produced some of the worst air and water pollution in the world. According to environmental officials, acid rain is falling on one-third of the country., half of the water its seven largest rivers is ‘completely useless’ ....., one-third of the urban population is breathing polluted air. **More than 70% of the rivers and lakes are polluted., and ground water in 90% of the cities is tainted.**



## Answer to Guess What?

- (a) Frank Gibney, *Japan: The Fragile Superpower*, W.W. Norton, 1975
  
- (b) Susan L. Shirk, *China: Fragile Superpower*, Oxford University Press, 2007

(Source: Chapter 6, A Planet Pressured, Bill Emmott, *Rivals – How The Power Struggle Between China, India, and Japan Will Shape Our Next Decade*, Penguin Books, 2008)

# Clear and Present National Danger

- @ CO2 emission **87%** of world average but **largest polluter**
- @ fresh water resource **1/3** world average; **36%** south of Yangtze has **80%** of water, prone to flooding of devastating proportions, **64%** north has **20%**, chronically beset by droughts
- All **7** main rivers and **25 of 27** largest lakes polluted; **500 million** inhabitants lacking ready access to safe drinking water
- **25%** land threatened by 2.6 m sq km desertification, affecting 400m people
- **Yellow River running dry** following years of increased irrigation, urbanization, silting and climate chaos (Fred Pearce, *When the Rivers Run Dry*, Random House, 2006)
- China's first-ever 400-page multi-departmental *National Assessment Report on Climate Chaos*, 26.12.2006:
  - Average **temperature** to rise 1.3 -2.1 degrees C by 2020
  - **Glaciers** on the Qinghai-Tibet Plateau, a main freshwater source, shrinking by 131.4 sq km p.a.. those in Western China melting down by 27.2% by 2050
  - **Extreme weather conditions** including floods and droughts likely to lead to diseases + water and food scarcity
  - **Dramatic transformation** of development model **needed**
- '*Unstable, Unbalanced, Uncoordinated, and Unsustainable*' (Premier Wen Jiabao, 5<sup>th</sup> Session of 10<sup>th</sup> NPC on 16.3.2007)
- Proactive role in post-Kyoto **Bali Roadmap**

# Imbalances

- Urban v **Rural**, Human v **Environmental**, Economic v **Social**, Local v **National**; Inward v **Outward Investment** (Premier Wen Jiabao, NPC March 2005)
- **Environmentally-unfriendly, energy-inefficient, low-margin and over-export-dependent** industrial production
- **Reckless** environmental exploitation for growth + **backward** technology, local protectionism and **vested interests**
- **Young EP ministry** v strong growth-oriented ministries
- **Extremely energy-inefficient** – 1/15 primary energy@ < US, 1/5 < Japanese, but 2 x Indian. Energy input @ GDP - 10 x Japan, 6.5 x UK, 4.3 x US, 3 x India.

# Energy Security

- **Massive energy demand**
  - **20m jobs** p.a. needed to maintain stability
  - **explosive urbanization** - by 2025 + 350m = 1b; 221 cities @ 1m (EU 35); 15 super-cities @ 25m; 11 hub-&-spoke conurbations @ 60m; 50,000 skyscrapers = 10 NYCs; GDP x 4 by 2020; concentrated urbanization mode = savings in 2.5% GDP in public expenditure and 35% emissions (*Mckinsey Global Institute*, March 2008),
  - **Largest and fastest-built national transport infrastructure** in human history – 2nd < US interstate highway system in 17 yrs, biggest railway expansion since 19th C - 78,000 km (25% world traffic but 6% of total length) to 100,000 km by 2020
  - **car ownership** from 16/1000 in 2002 to 267 by 2030 (world average 120/ 1,000, US 500/1,000). Current low car ownership already = ¼ world demand. 500 million cars by 2050 (*Goldman Sachs*)
  - **Fast growth needed** to lay sound foundation for a looming population aging profile
- Coal supplies **77%** of China's energy, **94%** self-sufficiency v OECD average 70% but coal x = crude oil in urbanization and transport. **8%** world **crude oil demand** v 25% for US, but China = **1/3 of global demand growth**, while China and US each sits on only 3% of world's oil reserves
- Clyde Prestowitz, *Three Billion New Capitalists: The Great Shift of Wealth and Power to the East*, Basic Books, 2005
- **Supply risks** – geopolitically unstable countries – ME, Russia, Central Asia, Africa, S America
- **Rivalry + territorial disputes** (e.g. Japan in S, China Sea and for supply from Australia)
- **Transportation risks** – Port of Hormuz near Iran, Malacca Strait
- **Energy geopolitics** (e.g. Russia in Europe, Iran, Venezuela, GCC, SCO, Africa)
- US – **Energy Independence** as policy to eliminate import from ME - *Winning the Oil Endgame* (Amory Lovins, Rocky Mountain Institute, 2004)
- **Arctic** cornucopia of resources and new transportation routes (*How the world will change with Global Warming*, University of Iceland Press, 2006)

# Food Security

- Unchecked **Climate Change** to decrease China's wheat, rice and corn production by **37%** by 2<sup>nd</sup> half of 21<sup>st</sup> century = **5 -10% food shortage in 20 years** (joint governmental report, March 2007)
- **Food prices to rise** with continuing global industrialization, population growth, use of agricultural land for bio-fuels, and climate change (inc water scarcity) (Fred Pearce, *When the Rivers Run Dry*, Eden Project Books, 2006)
- **9%** of world's arable land to support **20%** of population (+ water scarcity and pollution)
- Already **20 m farmers abandoning land** to seek alternative livelihood due to **foreign subsidized agricultural imports** (subsidy in EU 60%, US 50%, Japan 76.7%, China 1.23% as farming population huge)
- **Growing interest in food resources** –MENA energy-rich but food-scarce countries e.g. Saudi Arabia to invest in agriculture and livestock overseas; Libya exploring Ukraine wheat; China to acquire land in Brazil for soybean production (*Financial Times*, 8 May 2008).

# Quiet Revolution

- China's **@CO2 emissions** improved to 3.65 tons in 2004 = 87% of world average = 33% OECD level; China's emission intensity fell from 5.47KgCO2/US\$ in 1990 to 2.76KgCO2/US\$ in 2004 in constant prices (a reduction of 49.5% v world average reduction of 12.6% and OECD average of 16.1% ) (*IEA*)
- China's highest energy intensity in 1980 registered strong **energy productivity** - around 7.5% p.a. between 1990 and 2000. This trend has since drastically declined to only 1% p.a. China's **energy intensity** is now slightly above the world average, whereas it was 80% higher in 1990 (*World Energy Council, London*)
- 11th Five Year Plan (2006-2010) mandated targets of energy saving of **4% p.a.** and emission reduction of **2% p.a.** per unit GDP. Targets achieved in 2008 despite initial disappointment and remaining local recalcitrance
- **National Climate Change Program** on China's responses up to 2050, National Development and Reform Commission, June 2007
- **E-airtickets** only and ban on **plastic bags** 1.6.08



# Milestones & Roadmap (1)

- 2 new **nuclear power** plants annually for 15 years to expand capacity to 8.85 million KW by 2008
- South to North Water Diversion' project at a cost > \$60 billion + Three Gorges Dam to increase China's **hydroelectric power** from 108 GW to 290 GW by 2020. With capacity of 163 million KW in 2008, China's hydroelectric power potential is estimated at 400 GW
- **Wind** power, much of it in Inner Mongolia, is expected to grow from 1 GW to 30 GW, to power some 13-30 million households by 2020
- 30 million **solar** households = 60% world's current solar capacity, inc 65 MW PV energy (*Worldwatch Institute, Washington DC*). To increase solar panels to 300 million sq metres providing 2 GW power by 2020, displacing 40 million tonnes of coal annually. Plans for new generation of energy-efficient buildings + solar power where appropriate, for possible application nationwide.
- China's **solar manufacturers** = 10% world PV market in 2006, 3<sup>rd</sup> after Japan and Europe. To become one of the largest solar cell manufacturers in the world by 2010, with annual production capacity of 1 GW (*China Renewable Energy Development Overview 2008*). NYSE-listed Chinese solar energy corporation Suntech founder China's 4th richest man with wealth of \$1.4 billion



## Milestones & Roadmap (2)

- Small energy-inefficient and highly-polluting **coal** power plants being **closed**. The closure of <10m kW capacity completed by 2007. Next with capacity of < 50m kW.
- Deal with SASOL to build **CTL** plant in Ningxia and Shaanxi at total cost of \$10 billion with production target of 10 million tonnes crude oil by 2010, and 30 million tonnes by 2020 = **16%** China's overall crude oil output.
- International Finance Corp of World Bank has signed equity-and-loan deal with Xinao Group to convert coal into **dimethyl ether**, a cleaner gas for cooking and heating or as a substitute for diesel fuel.
- **bio-fuels and mixed fuels** China world's third largest **ethanol** producer, generating 1 billion gallons annually in Heilongjiang, Jilin, Liaoning, Anhui, and Henan, where **gasohol**, mixture of petrol and ethanol, made mandatory.
- Since December 2007, economic incentives to encourage bio-fuel production from **non-food agricultural products** e.g. forest biomass, sweet sorghum and cassava. Increasing use of human and animal waste to produce **methane** (26 million households have switched to methane thus generated by end of 2007)



## Milestones & Roadmap (3)

- Building the *Green Great Wall*, an **afforestation** belt of 4,480 km since 1978, the world's largest single ecological project. Coverage to expand to 18.21% of the nation by 2010. Absorbing 8% of China's green-house gas emissions or 500m tons CO<sub>2</sub> p.a., to increase to 20% absorption or 1 billion tons by 2010.
- United Nations set up a world **carbon trading exchange in Beijing** (*Financial Times*, 5 Feb, 2007).
- Promoting hydro, nuclear, coal-seam gas, biomass, wind, solar, terrestrial heat, wave and other renewable energies across the provinces + local and international environmental NGOs. **Greenpeace** delivering climate change project in China for past four years and invited to contribute suggestions for China's Renewable Energy Law, enacted 1.1.2006.
- '*Project 863*' launched March 1986 to develop alternative vehicles, including electric, hybrid, compressed natural gas (CNG), and hydrogen fuel-cell electric cars. **Electric Cars** with a reach of 120 miles at 80 mph being manufactured in Tianjin for launch in 2009. GM collaborated with Shanghai to invest > \$1 billion in hydrogen-fuel-cell-electric cars with urban infrastructure in bid to revive its global leadership. Green innovative technologies inc 1111 advanced micro-power, energy-storage and distribution grids set to revolutionize the world's car industries as well as to curb over-dependence on Oil. (Iain Carson & Vijay V Vaitheeswaran, *Zoom: The Global Race to Fuel the Car of the Future*, Twelve, Hachette Book Group, USA, 2007)



## Milestones & Roadmap (4)

- **Eco-cities** (e.g. Dongtan), towns and villages + eco-planning concepts, are on the cards for second or third-tier urban and rural communities springing up from scratch in mankind's largest and fastest urbanization drive in the coming decades.
- China to invest \$2.3 trillion in energy development during the period 2001-30, inc \$200 billion for renewable energy within the next 15 years, expected to grow from 7% to 10% annually by 2010 and 20% annually by 2020 (IEA estimate and Deutsche Bank study, 2006). In 2008, **renewable energy** accounts for 8.5% of China's primary energy utilization, to increase to **15% by 2020**.
- **Big Picture** - Greater fuel efficiency, lightweight car materials, advanced bio-fuels, and other technological breakthroughs to help achieve *Winning the Oil Endgame* (Amory Lovins et al, Rocky Mountain Institute, 2004). **Biggest job and wealth opportunity** in 21st Century (*Economist*, 18 November 2006). *SWFs - An Eastern Alchemy for Global Harmony*

















**Thank you**

Andrew K P Leung, SBS, FRSA

[www.andrewleunginternationalconsultants.com](http://www.andrewleunginternationalconsultants.com)