

**中国的能源，气候与发展战略
实现技术创新及有效执行政策
ENERGY EFFICIENCY, CLIMATE AND
CHINA'S DEVELOPMENT STRATEGY**

**Realising Technological Innovation and Effective Policy Implementation
Urbanisation and rising living standards**

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Overview

- Energy, Innovation & competitiveness
- Implementation challenges
 - A rising energy tide
 - Urbanisation & lifestyle changes
 - Motor vehicles
 - Buildings

Energy, innovation & competitiveness

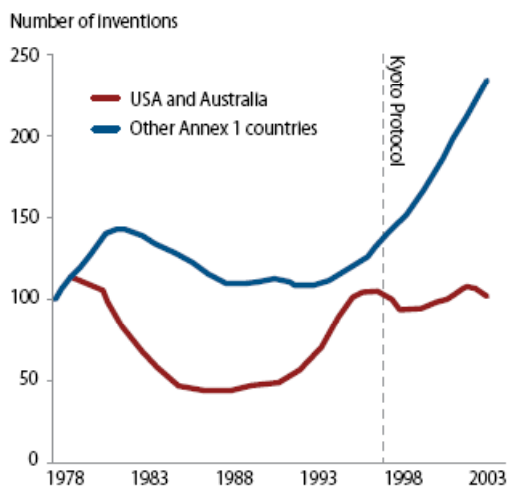
- “A new [economic] climate is starting to emerge, driven as much by resource scarcity and industrial innovation as by the raw realities of global warming” (HSBC, 2010)
- China is emerging as a world leader in clean technologies, which will enhance its competitive position in key industries.
- Furthermore, it is a large market and test-bed for new technologies and industries.
- The renewables sector and new energy vehicles are cases in point.
- These emerging new technologies will play a major role in shaping patterns of global competitiveness in the future.

Energy, innovation & competitiveness

- China is expected to focus on maximising the competitive and growth potential of climate change more than most other nations.
- China can seize the opportunity arising from the “dual crises” of climate change and global economic recession through a new industrial revolution based upon new energy technologies and industrial structural adjustment with new energy sources and a low carbon economy
- Wan Gang (2009), the Minister of Science and Information Technology

Realising opportunities

- Innovation trends, by number of inventions, among Annex I developed countries under the Kyoto Protocol
- Kyoto signatories saw resurgence in inventions



Source: Centre for American Progress (2010) *US out of the running*

Innovation, technology & competitiveness

- *China will accelerate the development of a low carbon economy and green economy so as to gain an advantageous position in the international industrial competition.*
- Wen Jiabao, 2009, World Economic Forum
- A key component of the development of the cleantech market is that it not only benefits China, but offers significant global benefits, beyond reducing global emissions, but also in bring costs down and advancing technological development and expansion.
- Need for increasing acknowledgement that 'new energy revolution' is not a 'zero-sum game' (BNEF, 2010)

Cleantech innovation & competitiveness

- The 'cleantech' revolution is now well underway in China, with companies, governments and venture capitalists investing heavily in new clean technologies, products and services across the whole value chain. (IEA, 2010)
- Not just based upon the development of new hard technologies, but also soft technologies
- Domestic policy incentives and assistance support access to finance as well as bolstering the skills base and the innovation environment of R&D

Cleantech innovation & competitiveness

- Learn from advances & failures in policymaking capabilities in the wealthy countries
- Strengthen collaboration on data, management systems, institutional developments and the mixed use of market & administrative instruments.
- Promote greater collaboration and risk taking in younger generation so as to foster creative strengths & unlock China's full potential
- Creativity selected as most crucial factor for future success of companies (IBM 2010 Global CEO Study)
"successfully navigating an increasing complex world will require creativity"

Implementation challenges remain

1. Central-local relations and the prevailing incentives for local governments to pursue rapid industrial growth.
2. The macroeconomic and pricing settings, such as relative prices for environmental costs, energy and for other resources.
3. China's differentiated development experience in wealth and opportunity between rich and poor, rural and urban as well as coastal and hinterland.
4. The institutional and effective market demand constraints on the rapid expansion of key social service areas (health, employment, education and social welfare).
5. Three 'inescapable realities'

Premier Wen Jiabao's review of 10th FYP review

The main problems were an unbalanced economic structure, weak capacity for independent innovation, slow change in the pattern of economic growth, excessive consumption of energy and resources, worsening environmental pollution, serious unemployment, imbalance between investment and consumption, widening gaps in development between urban and rural areas and between regions, growing disparities between certain income groups, and inadequate development of social programs. We need to work hard to solve all these problems.

Wen Jiabao (2006)

Implementation challenges

The combination of three 'inescapable realities':

- A. The lock-in effects of current industrial and infrastructure policies;
- B. The growing, and increasingly, urban population;
- C. The rising living standards of an increasingly middle class population.

A. 'Lock in' or 'window of opportunity'?

- Decisions and systems developed & adopted today will be locked into place for many decades to come
- Especially for 3 sectors of energy, transport and housing
- New power plants, highways, railways and buildings are inevitable – 40 year life span
- Energy sector progress rapid yet not sufficiently structural

A. The lock-in effects

- Ideology of economic growth remains pervasive
- New energy economy appears little different from old energy economy
 - Local governments continue to promote unrealistic output targets, eg. motor vehicle capacity and steel production targets
- High industrial growth = reinforcing coal's dominance
- Difficulties remain in shifting from quantity to quality
- 'Slower' GDP growth (approx. 8%) would realise greater structural change and energy shifts
- Strengthen measures to accelerate shift towards higher value added production

B. A growing, and increasingly, urban population

- Currently low per capita energy consumption will not remain
- Dependent relationship between future energy use, China's pattern of development, the rate of urbanisation and the lifestyle expectations of its people
- The growth in buildings, appliances and transport and attendant power demands are expected to become the major drivers of increasing energy use and carbon emissions in the near future
- Balancing household expectations with 'lifestyle aspirations'

C. The rising living standards of an increasingly middle class population

Benefits of 3 decades of rapid economic growth

- rising household incomes
- growing consumer confidence
- greater access to credit
- recent government stimulus measures such as rebates and tax reductions

Behavioural and lifestyle shifts

- World's largest car market yet per capita 1/20th of US

China Youth Daily urban survey (2010)

- 16% already own a vehicle
- 60% plan to purchase vehicle in next 5 years
- 25% acknowledge "peer pressure" and "social status" associated with cars

Servicing the urban billion

By 2030

- Additional 350 million urban residents
 - all searching for employment and housing;
 - all will require new apartments, office buildings and commercial centres
- 50,000 new high-rise residential buildings
- 170 new mass-transit systems
- 337 million vehicles on the road
- 800 million air conditioner units

- Energy will shift from industry-led to consumption-led

Summary

- China's intention is not only to secure energy supplies and improve energy efficiency but, in doing so, to become a world leader in clean technologies and to enhance its competitive position
- Current policy settings strongly support this approach, yet...
- Fundamental shift required on economic structure
- Behavioural changes require an increasing willingness to involve the general public in urban planning, awareness campaigns and behavioural changes through consultation, engagement, monitoring and the media.
- Critically, effectiveness in shifting individual and firm behaviour requires strong signals reinforced through pricing systems to promote energy conservation and the responsible production, purchase and use of energy efficient production processes and appliances .

Summary

- These issues shall be examined through the two case studies:
 - electric vehicles
 - energy efficient air conditioners
- Serious implementation issues remain regarding the best policy choices
- It is hoped that the strong leadership evidenced so far on these issues will result in the 11th Five Year Plan being seen as a critical turning point in China's development path and the 12th Five Year Plan as ushering in a more sustainable economic structure and 'harmonious' mode of development

"Resource efficiency, renewable energy and reductions in material throughput all have a vital role to play in ensuring the sustainability of economic activity. But... it is entirely fanciful to suppose that 'deep' emission and resource cuts can be achieved without confronting the structure of market economies."

UK Government (2010) *Prosperity Without Growth?*
London, Sustainable Development Commission



References

- BNEF (2010) *Joined at the Hip: The US-China clean energy relationship*. White paper, Bloomberg New Energy Finance: <http://www.newenergyfinance.com>
- CAP (2010) *Out of the running: How Germany, Spain, and China are seizing the energy opportunity and why the United States risks getting left behind*, Washington DC, Centre for American Progress (CAP)
- Fridley, DG, Zheng, N and Zhou, N (2008) *Estimating Total Energy Consumption and Emissions of China's Commercial and Office Buildings*, LBNL-248E, Lawrence Berkeley National Laboratory
- HSBC (2010) *Sizing the climate economy*, London, Hong Kong and Shanghai Banking Corporation
- McKinsey (2009)
- UK Government (2010) *Prosperity Without Growth?* London, Sustainable Development Commission
- Wen Jiabao (2006) Premier's Report on the Work of the Government during the 10th Five Year Plan (2001-2005) to the NPC, *Xinhua*, 5 March Accessed 16 April 2006 online: http://news.xinhuanet.com/english/2006-03/14/content_4303943.htm

Additional policy risks

- Rebound effect
- Picking favourite technologies, policies and sectors
- Relocated industry and manufacturing
- Carbon embedded exports

Rebound effects

- Energy efficiency measures can end up being counterproductive:
 - Increased usage & penetration: heating & air conditioning
 - Increasing size/weight: TVs & motor vehicles
- Closure and rationing of energy intensive industries risks short-term responses:
 - While provides clear message to local government and energy intensive industries of priorities, it avoids fundamental structural shifts, pricing adjustments and risks unexpected problems (diesel generators)

Picking favourites

- Access to finance and promotion of innovation, R&D and innovation should be encouraged across all technologies, sectors and regions of the economy

Therefore:

- Strengthen innovative environment and strategic R&D spending within public and private sectors: small and large - education plays a key role.
- Continue to promote regional innovation, especially in older industrial and coal-dependent zones.
- Maintain strict monitoring of policies or measures that result in the relocation of energy intensive and polluting industrial /manufacturing capacity to hinterland.
- SMEs and private firms should not be discriminated against in favour of large state owned enterprises

Embedded emissions

- Embedded emissions are a large part of China's exports (-20% CO₂-e)
- Risks remain in structural adjustment process following the experience of wealthy nations...
 - While an increasing number of China's manufacturers adopt energy efficiency and technological measures, manufacturers 'relocate' older second generation plant & equipment and production to hinterland as well as to overseas developing economies to take advantage of lower environmental controls & standards and labour price advantages.
- Need for greater international collaboration on energy efficiency standards, but also technology collaboration to avoid pollution relocation and accelerate uptake of best practice

Embedded emissions & a low carbon economy - can we decouple economy and carbon?

- Low carbon economy proposes that we need to decouple economic growth from carbon
- Similar argument found in energy efficiency and technological innovation: "we can grow through reducing material intensity"
- EU and Japan have been successfully in reducing their carbon and energy intensity... but
 - Achieved through structural economic adjustment
 - However, how much of the shift was dependent upon trade embedded emissions being moved off-shore?

Urbanisation

- Not path dependent
- Urbanisation with 'Chinese characteristics'
- Emphasis on 2nd and 3rd tier cities as well as regional centres – low carbon shift to regions
- Distributed population can be equally vibrant and avoid associated challenges of megalopolis (pollution, transport gridlock, long commutes)
- Invest in regional education, health and employment

Rising living standards

In 2009, China reached new heights

Energy

- Almost universal electricity coverage
- China's energy consumption = 2.265 billion tons of oil. (United States = 2.169 billion tons)
- Per capita, **one fifth** of US

Motor vehicles

- World's largest car market
- Per capita one twentieth of US

Buildings

- Of new buildings
- Further *** to be built
- Air conditioners

Transport



- Electric and hybrid vehicles are more about energy security, innovation and competitive advantage rather than energy efficiency.
- “The next five to 10 years are very crucial for the industrialization of the global new energy vehicle sector. China should seize the opportunity to lead the world”
– Wan Gang, Minister of Science & Technology (2010)
- Energy efficiency and new technologies are a part of the solution, but can create further problems
- Requires strategic urban and regional planning & enormous investment in rail-freight, high-speed railway, public transport and integrated transport systems

Buildings

- Almost ½ world’s building sites in China
- Annual expansion of 2 billion m² of new building floor space
- 90% of new buildings are considered to be high energy consumption buildings
- China’s building energy consumption grew from 10% of total primary energy in late 1970s to over 25% in 2006
- By 2020, it is expected to increase to 35%
- Overall, buildings are responsible for around 18% of energy-related carbon dioxide emissions in China.
- The building sector is expected to contribute 40% of the total energy savings target for the period 2000-2020