



World Business Council for
Sustainable Development

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**Future technologies and innovations in the cement sector:
CSI workshop, Beijing, China
16-17 November 2008**

Event background and purpose

Cement output in China in 2007 reached 1.36m tons, an increase of 10% over 2006, and 50% of global production. These figures demonstrate huge importance of involving the Chinese cement sector in global industry discussions, particularly in relation to climate and technology. CSI organised this first forum in China to:

- initiate such discussions with the cement sector and policy-makers
- encourage participation in CSI's Getting the Numbers Right (GNR) database
- explain the CSI Sectoral Approach modeling project and its initial results
- include a technical session on future innovations in cement sector technology, the third such dialogue following the first two in Washington (May 08) and Delhi (September 08), and invite Chinese cement sector to input into IEA technology roadmap development

Event participants

Approximately 80 senior level participants: CSI members and subsidiaries in China, Chinese cement industry (eg companies, plant managers, associations eg China Cement Association, China Building Materials Federation), Chinese policy-makers (National Development and Reform Commission of China), Ministry of Environmental Protection) international organisations (eg IEA, OECD, IFC, WRI), international policy-makers (eg EC, UK), equipment suppliers (eg FLSmidth, Sinoma), researchers (eg ECRA, Tsinghua University China), consultancies (eg Ecofys, ERM), and other industries (eg Sinopec, Wahun Iron and Steel).

Summaries

The Chinese cement industry (most information from Professor Cai Yuansheng, Institute of Technical Information for Building Materials Industry of China)

- currently enjoys a market-oriented environment with few administrative regulations
- 66% output found in richer East and central-South China – uneven levels of development and great regional disparity (small plants in poorer regions can't comply with high standards, whereas large ones aim to keep good reputation through strict quality assurance)
- cement industry data is incomplete, not unusual in China
- environmental monitoring is not systematic, although NDRC now working on indicator system for energy efficiency comparisons
- cement consumption per capita is 1 tonne/year, 3 times greater than that of many developed countries
- total capacity growing (although growth rate decreasing in both cement and metal industries), and cement industry is seeing decreasing exports (due to elimination of export subsidies, decreased demand from USA, increased competition from other regions)
- huge consolidation underway: 8,000 plants in 1994, 5,200 in 2007, 1,000 expected in 2030. Such restructuring plus regional disparity means it is hard to benchmark the industry. Government under high pressure from all levels during restructuring (eg unemployment through plant closure)



- low average building life span (30 years) is being increased
- 20% increase in forest cover planned by 2030 to substitute concrete + absorb CO₂ ?

China and climate change

Significant actions already taken by Chinese government re climate change, including Renewable Energy Law (16% by 2020) in 11th Five-Year Plan (2006-11), 20% reduction in energy consumption per GDP unit, development of a leading group on climate change (focused on energy reduction and efficiency) –first time a government department has been given responsibility over this. NDRC (National Development and Reform Commission, govt department responsible for economic structuring, and energy and sustainability strategies) oversee this group. 2008: government issued White Paper on Climate Change Activities.

Ms Li Liyan (Deputy Director, NDRC) emphasised China's promotion of a) 'common but differentiated responsibility' and China's need to develop as a low carbon economy at higher costs than previously high emitting developed countries, and b) Millennium Goal on climate change adaptation. 'China is a developing country' – it does not have international commitments, but is 'participating in discussions'. China Cement Association (CCA) will continue to push for efforts to provide explicit policy guidelines for industry.

Chinese government focusing on energy savings and efficiencies, alongside development of a 'stable and harmonious' society. Cement sector is viewed as a pillar in China's economic growth, but related environmental issues increasingly recognised and industry is being targeted by Ministry of Environmental Protection due to high energy inefficiencies and severe dust emissions. Cement one of 10 top priorities of NDRC in 2008-10 plans on energy efficiency. Target for Chinese cement sector: 50% energy consumption cut by 2020 (intensity target).

Mr Eamon Geraghty issued direct invitation to Chinese cement companies to join the CSI global database (GMR) and include Chinese data in database. Visual Basic system for CO₂ calculation in Chinese cement companies (using CSI/WRI protocol) already in place, so data does exist already one person stated. Average (although much variation between very high and low efficiency kilns) CO₂ per tonne of cement could be as high as 0.93tonnes (some dispute at this high figure, others believe closer to 0.85). GMR data shows average of 0.75 amongst CSI companies, ie is large potential for CO₂ reductions in China. It was noted that CSI activities including GMR data monitoring and inclusion lead to business efficiencies benefiting companies and the industry.

The Chinese cement industry and climate issues

China produced 4.7billion tonnes CO₂ in 2007, 15% of global emissions, of which 0.93billion tonnes (ie 20% of total) was from cement industry. Sector energy efficiency low (China industry counts for 70% of energy consumption, and cement is number one consumer), 1/5 of dust pollution in China. Some government action: more than 480 shaft kilns closed in 2007, 60% of clinker produced through dry process kilns in 2008. Government and industry focusing on energy efficiency savings.

A cement industry Sectoral Approach

CSI presented its modeling project and initial results, emphasising the wish to hear Chinese participants' views on these. Ms Li explained that the Sectoral Approach is 'perceived differently' in China from eg Europe, and that government does not see it as compatible to 'common and differentiated responsibility' principle. Similarly to discussions in September



08 CSI dialogue in India, the perception in China is that a sectoral approach involves a single global standard or target, but this is not what the CSI is proposing. Chinese government is therefore concerned with notion of harmonizing emission standards across one sector given huge regional and sector development discrepancies, and fears that uniform standard like a SA would lead to unfair development opportunities.

Emphasis that the cement sector cannot operate in a silo, and must look to dialogue with other high energy sectors eg if cement industry does develop a successful SA, it wont be readily accepted by authorities unless compatible with other industries too.

Technology innovation, development and diffusion

Chinese participants keen to engage in technology discussions. Wide range of technologies exist in China, strong efforts to update rapidly. Plans to close all wet kilns by 2009, reduce shaft kiln use to 30% of plants by 2010. High hopes for AFR (enough technical knowledge already) but barriers include inadequate waste collection and sorting, poor sewage treatment, and weak/non-existent legislative frameworks / policies with strong enforcement. 'Constant innovation' to improve industry's technology seen.

Emphasis that all technologies are important in long-term, but target emission reduction figures show CCS or another breakthrough technology is needed, plus a focus on R&D and demonstration projects. Public acceptance of CCS (globally) is not guaranteed – need good communication. Can take learning from power sector – similar but with different CO₂ concentrations. Mr Zhai Qi (Director General, Sinopec) emphasised urgency to move to implementation, and suggested demonstration project in petrochemical and cement industries.

International Finance Corporation (IFC) requested information on any plans for CCS demonstration plants in China (eg oxyfuel kilns), and asked industry to consider what financial assistance and incentives are needed to accelerate emission reductions, without waiting for govts to enforce trading systems? Chinese cement industry was asked what is needed as a next step to initiate demonstration project, and proposed that international funding (eg METI sponsoring of recent project) is necessary as companies are unwilling to take the risks on independently.

Suggestion to 'broaden mindset' and:

- investigate using non-Portland Cement in the long-term ie using higher amounts of clinker substitutes to produce, but still reaching market requirements. Ms Zeng proposed that such an approach reaches root cause of problem (ie mitigation) and is in the long-term more sustainable than end-of-life pipe treatment via CCS
- consider importance of strong 'soft skills' eg management. Same processes and equipment in different plants can bring different emission results due to management approach. Request for future guidelines/best practice exchange

Dr Dolf Gielen (Senior Analyst, IEA) introduced the IEA cement technology roadmap, and invited Chinese cement companies and suppliers to join the process, emphasising that the roadmap will not be effective without Chinese input. Dr Gielen also requested discussion on any technologies in China where access is an issue. Planned roadmap meetings: 21 January 2009 (Paris), March 2009 (Paris), June 2009 CEO roundtable (China)(three CSI CEOs to participate).



Sunday 16 November

1. **Welcome and introduction** (Dr Howard Klee, Project Director, WBCSD CSI)
2. **Expert perspective** (Ms Li Liyan, Division Director, China Climate Change Coordination Office, National Development and Reform Commission (NDRC))
3. **Expert perspective** (Mr Xu Yongmo, Vice President, China Building Materials Federation; Vice President, CBMF)
4. **China's Cement Sector today** (Professor Cui Yuansheng, Vice President, Institute of Technical Information for Building Materials Industry of China, National Cement Information Network)
5. **Remarks by CSI member** (Mr Patrick Verhagen, Senior Vice President, Holcim)

Monday 17 November

1. **Welcome and keynote speeches**
 1. Context for today's workshop (Dr Howard Klee, Project Director, WBCSD CSI)
 2. Development Plan and Policy for the Chinese cement industry (Mr Yang Chaofei, Director General, Department of Policy and Law, Ministry of Environmental Protection)
 3. Overview of China's Cement Sector today (Ms Zeng Xuemin, China Cement Association)
2. **Greenhouse gas emission reductions in the cement industry**
 1. A global cement database (Mr Eamon Geraghty, Technical Director, CRH Europe, CRH)
 2. CO2 emission measurement and reduction with cement industry in China (Professor Wang Lan, Cement Working Group, CBCSD Energy Efficiency and GHG Reduction Project)
 3. Plenary discussion
3. **Energy security and future energy forecasts** (Mr Han Wenke, Director of Energy Research Institute, National Development and Reform Commission (NDRC))
4. **Modeling the future cement industry** (Dr Howard Klee, Project Director, WBCSD CSI)
5. **Innovation and technology development** (Moderator: Dr Martin Schneider, Chief Executive, European Cement Research Association)

What is the future outlook?

- Optimization and innovation in the cement burning system (Mr Cai Yuliang, Director of Resource Centre, Sinoma)
- Developing a cement technology roadmap (Mr Dolf Gielen, Senior Analyst, International Energy Agency)

Transition to the future outlook

- Vertical roller mills for cement grinding: the 'OK Mill' (Mr Palle Steenbøl, General Manager, FLSmidth)
 - Potential for blending to contribute to emissions reductions (Dr Guanshu Li, Senior Engineer, Lafarge)
 - Potential for switching to less carbon-intensive, Alternative Fuels and Raw materials (AFR) (Mr Wang Huanzhong, General Manager, Huaxin Cement)
 - Carbon capture and storage (CCS) (Dr Martin Schneider, Chief Executive, European Cement Research Association)
5. **Open discussion** on possible areas for future action and useful next steps



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Cement Sustainability Initiative (CSI) China workshop, 16-17 November 2008: participants list

NAME	Organisation	Professional title
Cement Sustainability Initiative (CSI)		
WEI Lai	CEMEX Beijing Representative Office	Assistant to Chief Representative
Eamon GERAGHTY	CRH Europe	Technical Director
Christopher KELLEY	CRH China	Technical Director
Patrick VERHAGEN	Holcim	Senior Vice President
WANG Huanzhong	Huaxin Cement	General Manager, Mineral Feedstock Department
LI Guanshu	Lafarge Beijing Representative Office	Senior Engineer
ZHOU Haihong	Lafarge Beijing Representative Office	Senior Vice President
FAN Xiaohong	Lafarge	Environment Manager
Yoshito IZUMI	Taiheiyō Cement	General Manager
DONG Xiaoguang	Taiheiyō Cement (China) Investment, Ltd	General Manager Assistant Technical Department
Hitoshi UCHIDA	Taiheiyō Cement (China) Investment, Ltd	General Manager Assistant Technical Department
Howard KLEE	WBCSD CSI	Project Director
Caroline TWIGG	WBCSD CSI	Project Officer
Equipment suppliers		
GAO Changming	FLSmidth China	Senior Consultant
Palle STEENBØL	FLSmidth China	General Manager
CAI Yuliang	SINOMA	Director of Research Center
WU Xuanmin	SINOMA	Vice President
CHEN Hanmin	SINOMA	Professor, Senior Engineer



Chinese cement industry		
CAI Jinshan	Beijing Cement Plant	Deputy Production Manager
XIONG Yungui	Beijing Cement Plant	Chief Engineer
HU Rujin	Cement Magazine	Vice Chief Editor
XU Yongmo	China Building Materials Information Association (CBMIA)	Vice President
WANG Lan	China Building Materials Academy (CMBA)	Cement Working Group, CBCSD Energy Efficiency and GHG Reduction Project
XIAO Xianmin	China Building Materials Federation (CMBF)	Vice Director
WANG Yaming	China Building Materials Verification and Certification Center	Director
SHEN Lili	China Cement	Director, Consulting Dept.
HE Zhongying	China Cement	Analyst
ZENG Xuemin	China Cement Association (CCA)	Vice Chair
CUI Yuansheng	Institute of Technical Information for Building Materials Industry of China, National Cement Information Network	Professor / Vice President
LI Anping	Nanjing Kaisheng Cement Plant	Director, Technology Center
CHEN Yanzheng	Nanjing Kaisheng Cement Plant	Engineer, Technology Center
CHEN Zhongsheng	Shanshui Group	Deputy General Manager
Government		
Gustav MAURER	GTZ, Ministry of Agriculture, China	Manager, Project "Management of Obsolete Pesticides"
YANG Chaofei	Ministry of Environmental Protection (MEP), China	Director General, Department of Policy and Law
Fumio YAMASHITA	Ministry of Trade and Investment (METI), Japan	Housing Industry, Ceramics and Construction Materials Division, Manufacturing Industries Bureau
HAN Wenke	Energy Research Institute, National Development and Reform Commission of China (NDRC)	Director General
LI Liyan	China Climate Change Coordination Office, National Development and Reform Commission of China (NDRC)	Deputy Director



James GODBER	UK Embassy in China	1st Secretary & Head of Climate Change and Energy
Jonathan JOO-THOMSON	UK Embassy in China	2nd Secretary, Climate Change and Energy
Tina REDSHAW	UK Embassy in China	1st Secretary, Energy, Environment & Infrastructure, UKTI
International Organisations		
Martin SCHNEIDER	European Cement Research Assoc (ECRA)	Chief Executive
Dolf GIELEN	International Energy Agency (IEA)	Senior Analyst
Michel FOLLIET	International Finance Corporation (IFC)	Principal Industry Specialist, Global Manufacturing and Services Department
Simon UPTON	Organisation for Economic Cooperation and Development (OECD)	Chairman, Roundtable on Sustainable Development
Akihiro SAWA	The 21 st Century Public Policy Institute	Senior Executive Fellow
James New	United Nations Industrial Development Organization	Industrial Development Officer
Pankaj BHATIA	World Resources Institute (WRI)	Director, GHG Protocol Initiative
Stephen RUSSELL	World Resources Institute (WRI)	Associate
Neelam SINGH	World Resources Institute (WRI)	Associate
Other industry		
ZHAN Kun	Sinopec	Deputy Director-General, Safety and Environmental Protection Bureau
ZHAN Wenhai	Sinopec	Director, Safety and Environmental Protection Bureau
LI Xihong	Economics & Development Research Institute (EDRI), SINOPEC	President
ZHAI Qi	Sinopec	Director General; Secretary General of China BCSD
Other China		
CUI Suping	Beijing University of Technology	
DING Xinmiao	China Building Materials Verification and Certification Center	Engineer
YUAN Xiuxia	China Building Materials Verification and Certification Center	Engineer
LI Chen	China Standard Certification, China National Institute of Standardization	Project Manager



ZHANG Jianyu	Environmental Defense China Program	Program Manager
Betty TAM	Herbert Smith LLP (Shanghai Representative)	Senior Associate
WENJIA Cai	Tsinghua University	Energy and Environmental Technology Center
ZIWEI Mao	Tsinghua University	Energy and Environmental Technology Center
ZHENG Ping	WWF China	Business and Energy Efficiency Officer
Other international		
GUO Jun	Arreon Carbon UK Limited	
Grace ZHOU	Climate Change Capital	
ZHANG Lulu	Climate Change Capital	
Christian ELLERMAN	Ecofys	Consultant Energy & Climate Strategies
Padraig Oliver	Ecofys	Energy Strategy Consultant
Stephen COPPINGER	Energy Services, California Portland Cement Company	Director of Energy Service
Robert HANSOR	Environmental Resource Management (ERM)	Consultant
Doug MCLACHLIN	Environmental Resource Management (ERM)	Partner
ZHANG Qinghong	Environmental Resource Management (ERM)	Consultant
Lee SOLSBERY	Environmental Resource Management (ERM)	Global Technical Director
Jessie WANG	Environmental Resource Management (ERM)	Consultant
Daniel WAI KWOK HU	JPMorgan	Vice President
Lynn PRICE	Lawrence Berkeley National Laboratory (LBNL)	Research Scientist, China Energy Group
Philip REUCLIN	WBCSD Regional Network	Assistant Manager