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Energy and Resources

Pathways to a Greener Asia: Opportunities and challenges.

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Contents

Introduction

The Asian energy industry is currently experiencing a period of massive change and uncertainty. This is a result of rapid increases in demand for fossil fuels and electricity at a time when climate change is high on many political agendas. Previously low growth countries are emerging as new economic powerhouses and their growing middle class populations want all of the necessities many in the West take for granted – cars, houses and appliances. The key challenge for Asia – as well as other regions of the world – is to provide energy in an affordable yet environmentally sustainable way while maintaining adequate levels of economic growth.

One of the most important initiatives currently being undertaken in Asia is China's 11th Five-Year plan. The plan has a strong theme in the conservation of resources, but also contains provisions for conserving oil and substitutes, mostly through biofuels, liquids and coal. Further, China's new Renewable Energy Law went into effect in January 2006. India's government has followed a similar path with the preparation of the New and Renewable Energy Policy Statement in 2005, which provides a strategic vision up to 2100 for new and renewable energy sources. Key development initiatives include the development of electric hybrid vehicles, hydrogen, biomass, wind and solar power. Additionally, all Asian economies, excluding Taiwan, can take advantage of Kyoto's Clean Development Mechanism (CDM). These incentives present opportunities for companies looking to diversify their asset portfolios and develop electricity from renewable or cleaner energy sources.

In Australia, Prime Minister Kevin Rudd is to make climate change the top priority of his new government with a commitment to reduce greenhouse gas emissions by 60 percent on 2000 levels by 2050.[1] Complimenting this action plan is the much-anticipated release of the Garnaut Climate Change Review. According to the Review:[2] "Australia should make firm commitments in 2008, to 2020 and 2050 emissions targets that embody similar adjustment cost to that accepted by other developed countries. Some version of the current State and Federal targets of 60 percent reduction by 2050, with appropriate interim targets, would meet these requirements."

In September 2007 the New Zealand government released its proposal for an all sources, all gases emissions trading system for New Zealand. The country has also gained recent notoriety for providing global leadership on climate change strategy. New Zealand climate change expert Helen Plume was elected to chair an important scientific group under the United Nation's Framework Convention on Climate Change (UNFCCC).[3] Ms. Plume, a senior member of the Climate Change Policy team at the Ministry for the Environment, will chair the UNFCC Subsidiary Body for Scientific and Technological Advice for the next two years. This the first time New Zealand has held such a role.

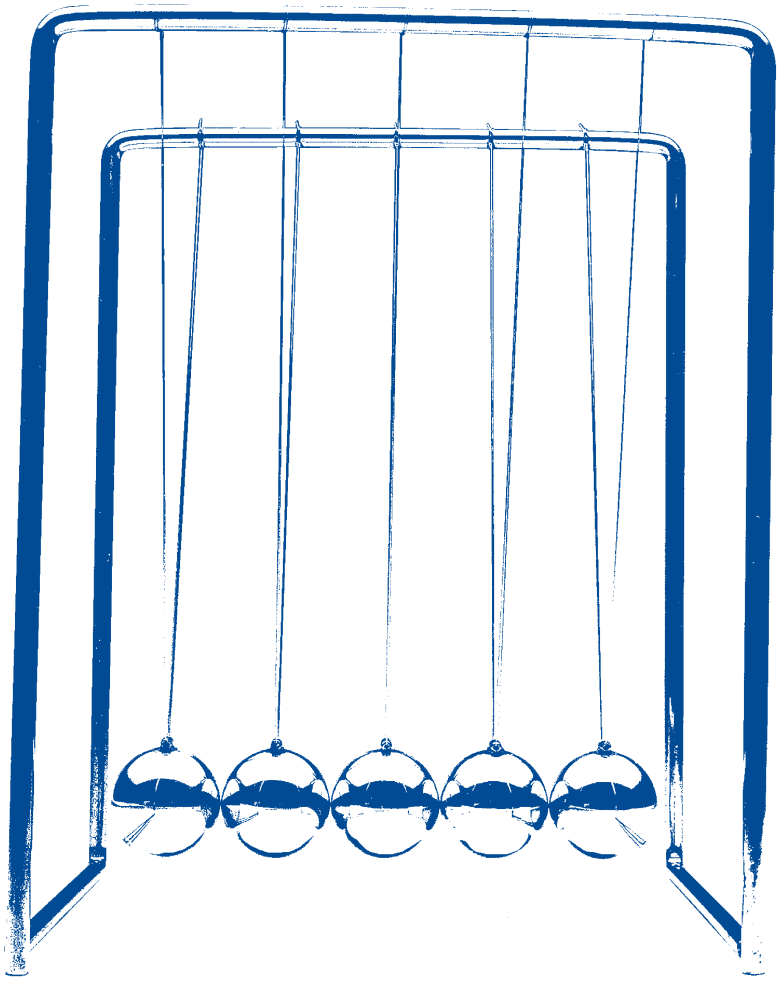
Asia is not alone in this endeavor. Governments around the world are implementing a range of climate change regulations and policies. The European Union, through its Emissions Trading Scheme (ETS), is viewed by many as a leader in carbon trading. The EU has aggressive targets for increasing renewable energy with a commitment to 20% by 2020.[4] Moreover, the European Commission recently revealed its proposals for what could be a tough Phase III. It is to be expected that the Commission will propose a move to one EU-wide emissions limit against which all industry allocations will be set. This proposal would remove the current system of national allocation plans that allowed differential allocations of EU allowances in the first two phases.[5]

On a national level, President George W. Bush recently signed into legislation the Energy Independence and Security Act of 2007. The bill includes revisions to improve fuel economy standards in cars and trucks as well as energy efficiency in lighting and appliances.

The state of California has shown leadership in committing to reduce its global warming emissions levels. On September 27, 2006, Governor Schwarzenegger signed the Global Warming Solutions Act, AB 32, which caps the state's greenhouse gas (GHG) emissions at 1990 levels by 2020.[6] This is the first statewide programme in the country to mandate an economy-wide emissions cap that includes enforceable penalties. On a more regional level, the Regional Greenhouse Gas Initiative is a coalition of Northeastern states that are due to commence trading beginning in 2009.

As Asia looks to maintain robust economic growth while increasing its green credentials, several challenges remain:

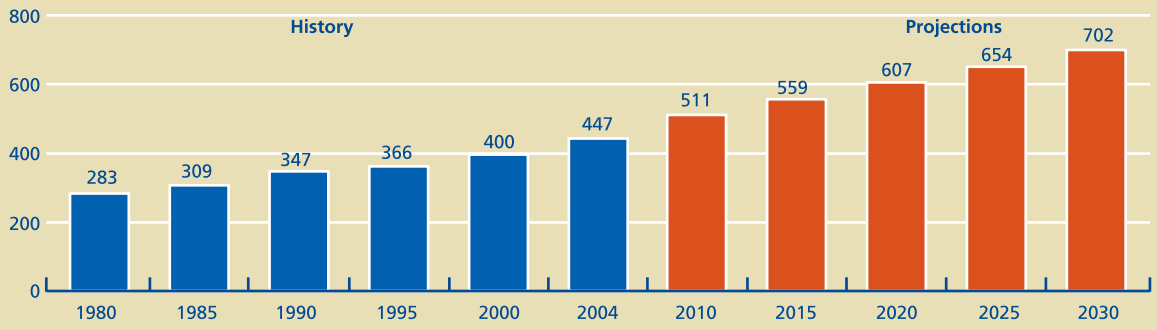
- developing countries want developed countries like the U.S. to share cutting-edge renewable-energy technology at reduced costs; should there be a trade-off between costs and climate protection?
- is carbon capture and storage a viable solution for regional power producers?
- what impact will the recently developed Bali Road Map have on the region?



The role of growth in energy demand

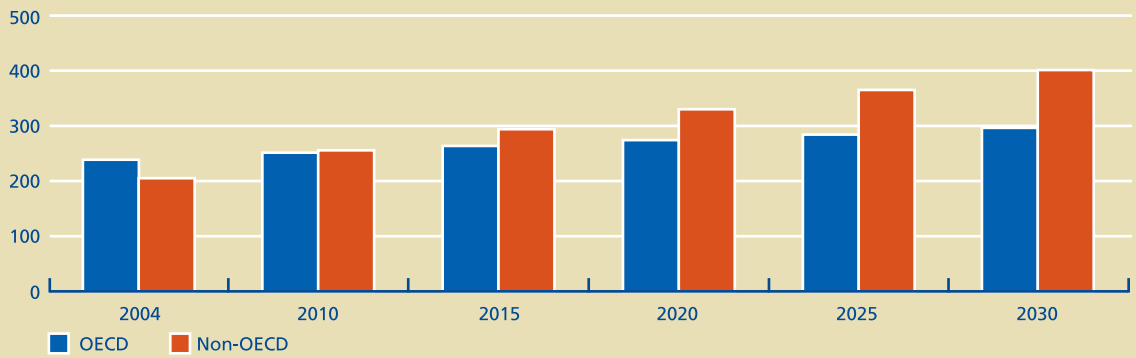
By 2030, energy use is expected to increase by 57 percent (Figure 1). The largest projected increase in energy demand is for the non-OECD region, specifically in non-OECD Asia, which includes China and India (Figure 2 and 3). Energy demand in the non-OECD Asia region is projected to grow at an average rate of 3.2 percent per year, more than doubling over the 2004 to 2030 period and accounting for more than 65 percent of the increase in energy use for the non-OECD region as a whole (Figure 2). In 2004, energy consumption in the countries of non-OECD Asia made up just over 48 percent of the non-OECD total; by 2030, its share is projected to be above 56 percent (Figure 3). Driving energy demand is the expectation that several Asian economies may grow by at least 4 percent or more over the next 12 months (Figure 4).

Figure 1: World energy consumption, 1980-2030 (Quadrillion Btu)



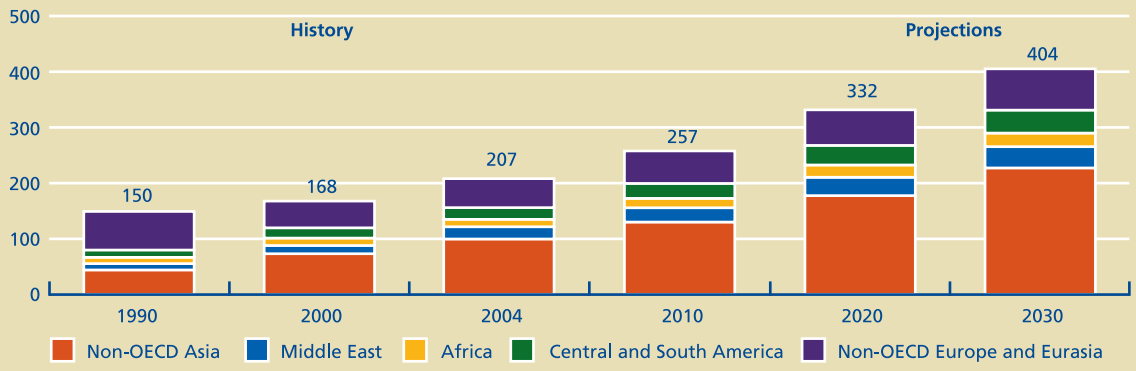
Source: History - Energy Information Administration (EIA). International Energy Annual 2004 (May-July 2006). web site www.eia.doe.gov/iea. Projections - EIA. System for the Analysis of Global Energy Markets (2007).

Figure 2: World energy use: OECD versus Non-OECD, 2004-2030 (Quadrillion Btu)



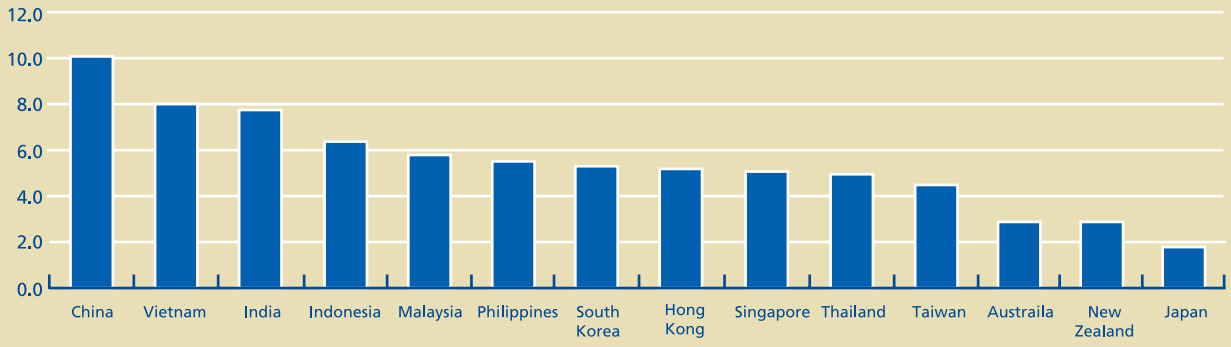
Source: 2004 - Energy Information Administration (EIA). International Energy Annual 2004 (May-July 2006). web site www.eia.doe.gov/iea. Projections - EIA. System for the Analysis of Global Energy Markets (2007).

Figure 3: Energy use in the Non-OECD economies by region, 1990-2030 (Quadrillion Btu)



Source: History - Energy Information Administration (EIA). International Energy Annual 2004 (May-July 2006). web site www.eia.doe.gov/iea. Projections - EIA. System for the Analysis of Global Energy Markets (2007).

Figure 4: Projected 2008 growth (%) in selected Asian economies



Source: Economist Intelligence Unit. The World in 2008.

When researchers analyse the Asia-Pacific region as a whole, one factor appears to be impacting growing energy demand: population growth. With 1.31 billion people, China has the largest population in the world – one-fifth of the global total. China's population is forecasted to increase to 1.46 billion by 2030. China already contains eight cities with populations of more than 5 million, and 88 cities with between 1 and 5 million, though only 42 percent of the population lives in urban areas. A similar scenario is being played out in India. The International Energy Agency's *World Energy Outlook 2007* assumes that the population, which stands at 1.1 billion, will increase by 1.1 percent per year on average to 2030, reaching 1.45 billion.[7] According to the United Nations Population Division, India is expected to become the most populous country in the world in 2031.[8]

Population growth and emissions

To measure the impact population growth has on the economy, and therefore the amount of greenhouse gas (GHG) emissions being released, researchers have developed an equation called the IPAT identity. The IPAT identity states that environmental impacts such as emissions are the product of the level of population multiplied by affluence (income per capita, i.e. gross domestic product (GDP) divided by population) multiplied by the level of technology deployed (emissions per unit of income) or:

Impact = Population x Affluence x Technology

When the IPAT identity is used to describe the affects of population on CO_2 emissions, it is often referred to as the Kaya identity which is stated as:

CO_2 Emissions = Population x (GDP/Population) x (Energy/GDP) x (CO_2/Energy)

Taken at face value, the IPAT and Kaya identities appear to suggest that CO_2 emissions grow in a linear fashion with population increases, and highlights the challenge of reducing emissions while population increases.

Source: IPCC Special Report on Emissions Scenarios. Intergovernmental Panel on Climate Change. http://www.grida.no/climate/ipcc/emissions/050.htm

Binding targets and commitments: What's the difference?

The words "binding targets" and "commitments" are frequently used in climate change discussions, but what do they actually mean?

Binding targets can be defined as: "Measurable, reportable and verifiable nationally appropriate mitigation commitments or actions, including quantifiable emission limitation and reduction objectives, by all developed country Parties, while ensuring the comparability of efforts among them, taking into account differences in their national circumstances." In essence, binding targets refer to emissions reduction commitments made by developed countries.

Commitments, on the other hand, are relevant to developing countries and can be defined as: "Nationally appropriate mitigation actions by developing country Parties in the context of sustainable development, supported and enabled by technology, financing and capacity-building, in a measurable, reportable and verifiable manner."

Source: Bali Action Plan, Advance unedited version, Decision -/CP.13. http://www.unisdr.org/eng/risk-reduction/climate-change/docs/Bali-Action-plan.pdf

Japan as a model for energy efficiency

In the farming town of Kamiita, Japan, local residents are providing a unique example as to how government policy and business combine to form a model of energy efficiency. During a typical winter, local officials routinely shut off the heating system in the town hall, leaving themselves and 100 workers no respite from low temperatures. Workers come to the office in coats and wool hats while drinking hot tea. To cut back on gasoline use, the town's 13,000 citizens strictly obey a nationwide call to turn off their car engines while idling, particularly at traffic lights.

This obsession with energy conservation and efficiency are in evidence all around Japan, from homes and businesses to government offices. After the 1970s oil crisis, Japan went into emergency mode. Since the country has limited natural resources, it has been forced to rely on imports to meet its energy needs. Over the last three decades, Japan has weaned itself off oil. It now imports 16 percent less oil than it did in 1973, although the economy has doubled. The country now accounts for 48 percent of the world's solar power generation - compared with 15 percent in the U.S. How was a country like Japan, with limited indigenous supplies of energy come to be a global benchmark in energy efficiency?

At the outset of Japan's efforts to become more energy efficient, the guiding hand of the government has played a dominant role. It has forced households and companies to conserve by raising the cost of gasoline and electricity far above global levels. Taxes and price controls make a gallon of gasoline in Japan currently cost about $5.20, twice the U.S. more market-based prices. The government in turn has used the tax revenues to lay the groundwork that has allowed the country to seize the lead in renewable energies like solar power.

Business has responded by developing innovative products such as low-energy washing machines and televisions and high-mileage cars. Japanese companies continue to develop energy-efficient appliances such as a refrigerator that beeps when left open and the dishwasher that is compact enough to sit on the kitchen counter. In some homes, room heaters have a sensor that directs heat only when occupants are present.

Perhaps the most important element in Japan's energy efficiency model is the role played by the population. It is not uncommon for families to take turns bathing in the same water. Afterward, the still-warm water is sucked through a rubber tube into the nearby washing machine to clean clothes. Wet laundry is hung outside to dry or under a heat lamp in the bathroom. During the winter, family members congregate in the living room which is about the size of an American bedroom. It is often the only room that is heated.

Sources: Martin Fackler "The Land of Rising Conservation." New York Times January 6, 2007; Anthony Faiola "Japanese Putting All Their Energy into Saving Fuel." Washington Post Foreign Service February 16, 2006, A01.

National climate change strategies

Highlights from national climate change strategies for selected Asian regions are presented below.

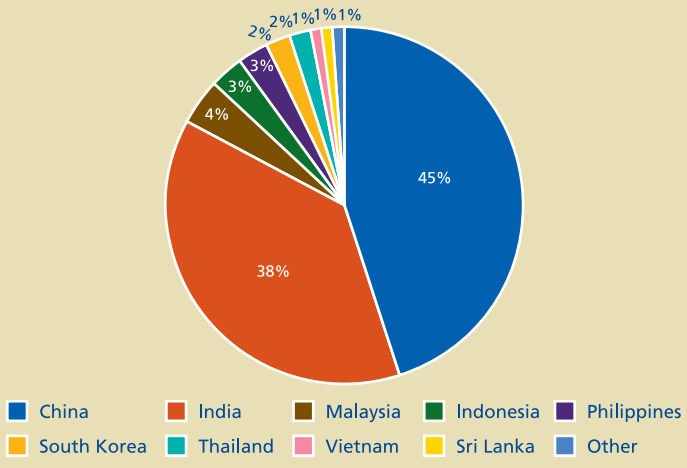
Chinese Mainland

Chinese Mainland has ratified and signed the Kyoto Protocol, making the Chinese Mainland eligible for participation in Clean Development Mechanism (CDM) projects. The National Development and Reform Commission (NDRC) has been designated as the national authority for CDM and is responsible for the following:

- accepting CDM project applications;
- approving CDM project activities jointly with the Ministry of Science and Technology and the Ministry of Foreign Affairs;
- issuing written approval letters on behalf of the government; and
- supervising the implementation of CDM project activities.

The government's reaction to the CDM has gradually shifted from cautious acceptance, to conditional support, to growing emphasis. The Chinese government believes that CDM projects are a resource that belongs to the Chinese people, and so actively monitors the terms of CDM contracts, restricts foreign investment, and applies a levy to CDM revenues.

Figure 5: CDM projects in Asia (through 3rd quarter 2007)



Source: www.cdmpipeline.org/cdm-projects-region.htm

Within the last several years, the Chinese government has been actively seeking ways of reducing greenhouse gas emissions while managing any potential impact on the economy. In September 2005, the Chinese government entered into a Partnership on Climate Change with the EU. This important partnership contains two cooperation goals, which are to be achieved by 2020. The government wants to develop and demonstrate advanced 'zero-emissions' coal technology which would allow for the capture of CO_2 emissions. The second goal is to significantly reduce the cost of key technologies and promote their development and deployment.

Under the National Renewable Energy Law adopted in 2005, Chinese Mainland has set a target of producing 16 percent of its primary energy from renewable sources by 2020, up from roughly 7 percent at present.[9] For the electricity sector, the target is 20 percent of the capacity from renewables by 2020, including 30 GW of wind power, 20 GW of biomass power and 300 GW of hydropower capacity.[10]

The National Climate Change Programme (NCCP) that was issued on June 4, 2007 by the NDRC further accentuates the government's commitment to adopt administrative, economic, and legislative measures to increase power efficiency. Regional administration processes are being established to better coordinate work dealing with climate change. In addition, a national leading group on climate change was formed headed by Premier Wen Jiabo.

Hong Kong

Hong Kong is included in Kyoto by virtue of its relationship with the Chinese Mainland. The government has begun to assess the impact of climate change by reviewing the most recent international studies. Although the government is committed to participating in international efforts to reduce GHG emissions, its current policy is geared towards raising its populations' quality of life and in further developing Hong Kong into a quality metropolis. A reduction in GHG emissions will be part of this strategy.

The government's GHG initiative is outlined in the 2007-2008 Policy Agenda, as elaborated in a note made by the Environmental Protection Department to LEGCO.[11] The Hong Kong government has taken a two-pronged approach by seeking to balance the need of protecting the environment and sustaining economic and social development. A number of concrete steps have been taken by the government to advance their policy.

In January 2005, Hong Kong signed up to the Renewable Energy and Energy Efficiency Partnership (REEEP) which is a Type II World Summit on Sustainable Development partnership. It aims to reduce GHG, promote energy efficiency, and increase affordable uses of renewable energy.[12] The Asia-Pacific Economic Co-operation (APEC) Leaders' Declaration on Climate Change, Energy Security, and Clean Development was adopted in Sydney on September 9, 2007. The Declaration sets out a series of actions and initiatives. One of these is improving energy efficiency. As an APEC member, Hong Kong will honour its pledge and seek to achieve a reduction in energy intensity of at least 25 percent by 2030, using 2005 as a base year.[13]

India

India has undertaken numerous response measures that are contributing to the objectives of the United Nations Framework Convention on Climate Change (UNFCCC). Much as Hong Kong's initiatives have done, India's development plans strike a balance between economic development and environmental concerns. In the last few years, several policy measures relating to climate change have been introduced.

India is party to both the Asia Pacific Partnership on Clean Development and Climate (APP) and the Kyoto Protocol. In order to participate in CDM projects under the Kyoto Protocol, the Indian government has formed the National Clean Development Mechanism Authority which has the following authority:

- to receive projects for evaluation;
- to assess the probability of eventual successful implementation of CDM projects;
- to evaluate the extent to which projects meet the sustainable development objectives; and
- to carry out a financial review of project proposals.

Perhaps India's most important development as it relates to climate change is the launching of the EU-India Initiative on Clean Development and Climate Change.[14] This initiative is a part of the political declaration on the India-EU Strategic Partnership. The declaration was taken a step further in a Joint Action Plan which focused on voluntary practical measures. Both signatories have agreed to:

- identify and develop ways of widening access and overcoming the barriers to dissemination of such technologies in India and the EU;
- increase funding and promote public-private partnerships for R&D of cleaner technologies;
- promote adaptive R&D to suit the resource endowment of both parties; and
- reduce the price gap between cleaner and less efficient technologies by seeking economies of scale.

While the previous sections provide an overview of selected national climate change programmes, the following pages frame a discussion on several challenges in the region. These challenges are:

- the technology transfer conundrum;
- carbon capture and storage; and
- the Bali Action Plan.

The technology transfer conundrum

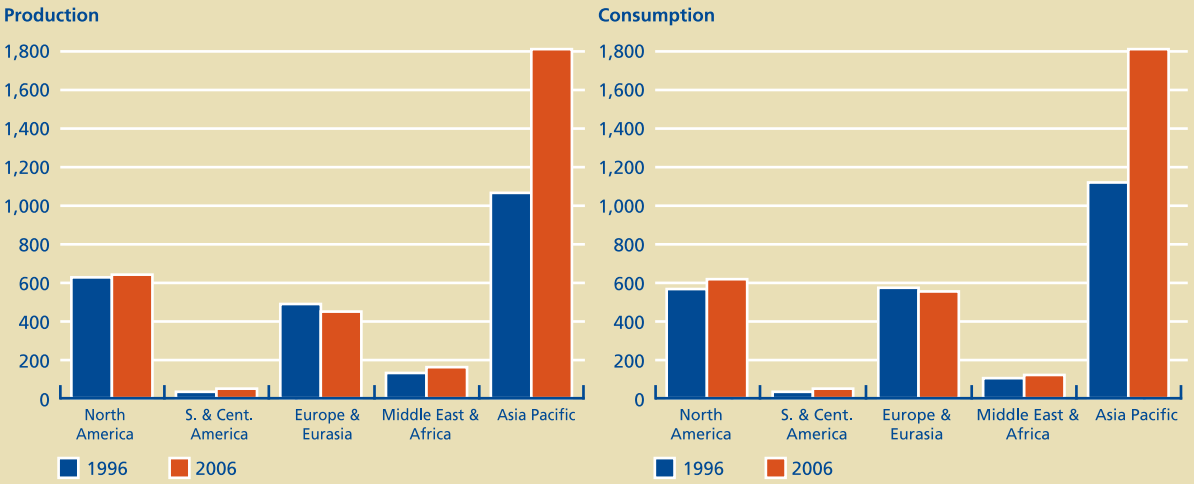
For years, the U.S. and China have been involved in heated discussions around the issue of intellectual property rights. With today's focus on global warming and climate change, this debate has gathered new momentum focusing on cutting-edge technology to reduce carbon emissions. At the recently concluded U.N. conference on climate change in Bali, Indonesia, China proposed that developed nations share their technology with the developing world at reduced costs, in order to facilitate the rate at which poor nations cut their dependence on fossil fuels. This proposal is meeting resistance from companies that have developed the new technology but are reluctant to allow it to be sold below cost. There now appears to be a technology transfer conundrum: intellectual property rights or climate protection.

Multinational companies are beginning to participate in a new U.S. government programme that aims to help factories in China reduce their carbon emissions while it generates business for American and other environmental-service companies. The idea is to arrange for Chinese businesses that have limited knowledge of environmental technologies to essentially outsource the cleaning and greening of their factories. This new programme is known as P2E2 – which stands for pollution prevention and energy efficiency – aims to connect the factories with capital and expertise to help them upgrade equipment and cut their emissions and energy use. Banks and equity investors provide the funding and loans to environmental and energy-service companies, which have the expertise and technology to help factories boost energy efficiency. According to U.S. government estimates, annual spending on this programme could reach $1 trillion through 2025.[15]

Carbon capture and storage

Coal is one of the most abundant sources of energy on earth and in many fuel source scenarios the cheapest to use. Coal was again the world's fastest growing fossil fuel in 2006. Global consumption rose by 4.5 percent compared with a 10-year average of 2.8 percent. The Asia Pacific region accounted for nearly 90 percent of global growth in consumption and 80 percent of the growth in production (Figure 6).

Figure 6: Global coal production and consumption, 2006 (Million tonnes oil equivalent)



Sources: BP Statistical Review of World Energy June, 2007

That said, coal is also one of the dirtiest forms of fossil fuels, responsible for a large portion of CO_2 emissions. The percentage share of coal in global emissions is set to rise over the International Energy Agency's projection period to 2030 (Figure 7).

Figure 7: Share of coal in CO_2 emissions in the IEA reference scenario (%)

	1990	2000	2005	2015	2030
China	85	80	82	82	78
India	69	65	67	68	69
OECD	37	34	34	34	33
World	40	38	41	44	45

Source: World Energy Outlook 2007: China and India Insights

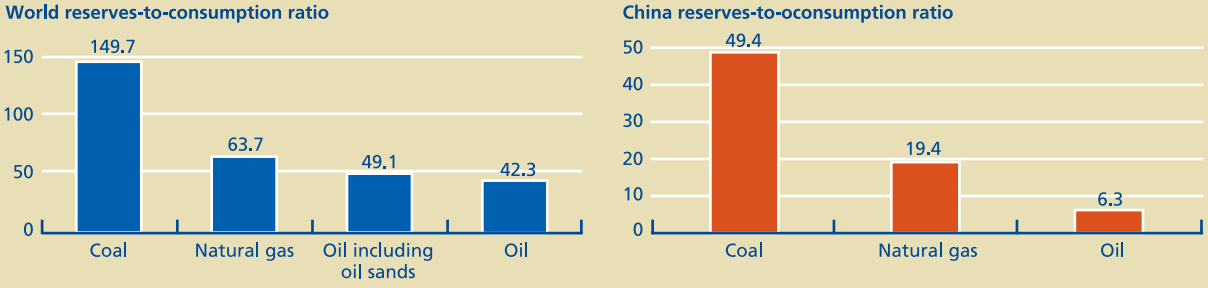
According to IEA estimates, were both China and India to reach the OECD level of efficiency for new coal power plants by the year 2012, the cumulative saving in emissions through to 2030 would be in the order of 6.8 Gt. The potential impact of accelerating the deployment of clean coal technologies is greatest in China and India given their rates of production and consumption. Add to this media reports suggesting that China's local governments, utilities, and entrepreneurs are building, on average, one or two coal-fired power plant per week,[16] it would appear that clean coal technologies including integrated gasification combined cycle (IGCC) carbon capture and sequestration (CCS) technologies are critically needed.

At the present time, there is no large scale power plant equipped with carbon capture and storage technology anywhere in the world. However, China sees CCS as a future technological option for greenhouse-gas emissions abatement and has joined international efforts for its development.[17] Thus far, international cooperation programmes have been initiated with the Asia Pacific Economic Cooperation (APEC), Canada, the European Union, the United Kingdom, and the United States which includes the Carbon Sequestration Leadership Forum.

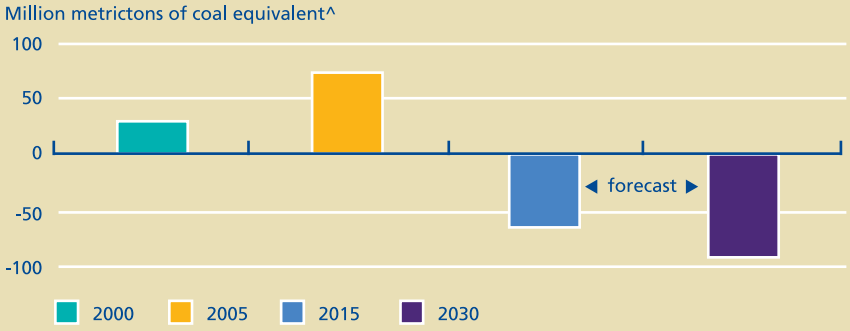
One of the more difficult challenges to overcome with new technologies is the cost. IGCC plants are estimated to cost 10 to 20 percent more per megawatt than pulverised-coal-fired-plants – and that's without including carbon dioxide capture.[18] China's power producers, much like their counterparts around the world, are waiting for a financial or political reason to make a switch.[19] Part of the issue stems from a lack of regulation that penalises conventional coal plants, although this is not limited to China. At times, Chinese Mainland's environmental agencies lack the resources and power to make companies comply even with regulations on the books. Top officials in Beijing admit that their edicts are sometimes ignored, as new power plants are erected without environmental assessments.[20]

Figure 8: Taking lumps

Coal is the most plentiful fossil fuel...
Remaining years of reserves if consumed at the current rate



But China's surging demand could put pressure on the market
China's actual and forecast coal production less its consumption



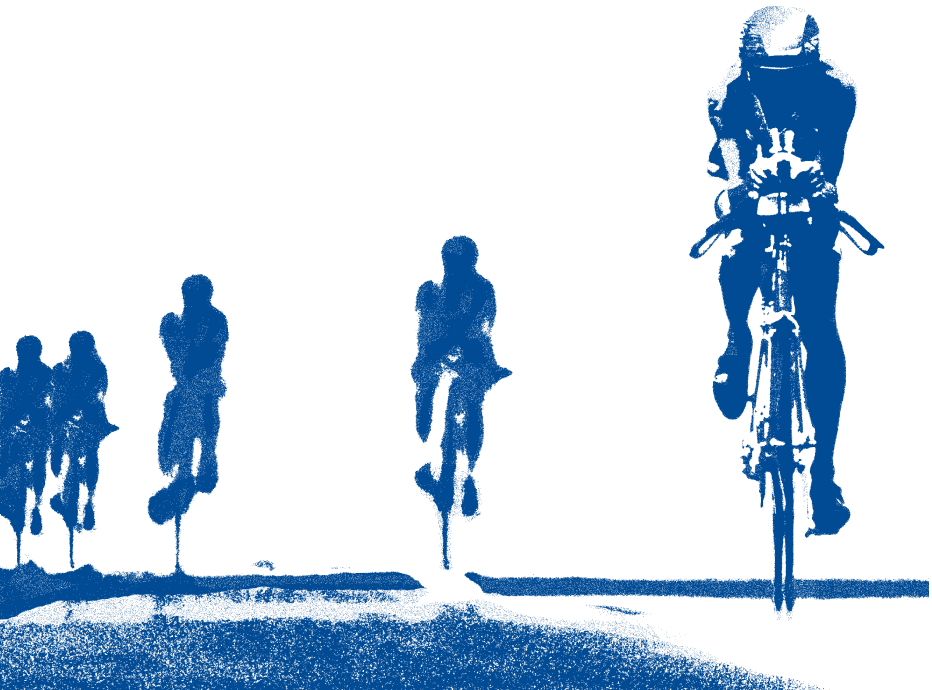
* Coal, oil and natural gas reserves are as of the end 2006, and are those defined as proved
^ Coal equivalent measures coal in terrins of its caloric output to allow different types of coal to be measured together

Source: BP Statistical Review of World Energy 2007 (fossil-fuel reserves and consumption); International Energy Agency World Energy Outlook 2007 (China's consumption and production).

Shai Oster and Ann Davis. "China Spurs Coal Price Surge." Wall Street Journal February 12, 2008 A1.

The Bali Action Plan

On a Saturday in mid-December 2007, the United Nations Framework Conference on Climate Change came to a close. The 190 odd participating countries agreed to work together to create a treaty by 2009 – to take effect in 2013 – which they can bring to their governments to ratify or reject. Several other achievements were made. First, both developed and developing nations acknowledged the threat of a changing climate and the need for urgent action by all. Secondly, the treaty, if adopted, will likely bind only the developed countries (approximately 38) to emissions reductions.[21] Third, developing countries would agree to take "nationally appropriate mitigation actions" which would be "measurable, reportable, and verifiable." And finally, a decision was made to set up a pilot project to investigate how to stop tropical deforestation.[22] Developing countries may be expected to pursue more carbon-friendly development strategies. They could also expect to receive special financing from industrialised countries to help adapt to the threats of rising seas, more frequent extreme weather events, falling crop yields, and increasing migration.



Future challenges and responses

Climate change appears to be one of the most critical issues affecting the world, perhaps more so in Asia for a number of reasons. Growing populations, especially in China and India, coupled with economic growth, are likely to impact energy demand now and through 2030. Both appear likely to increase emissions. Asia's climate change challenge is all the more important by the disproportionate impact that climate change appears to have had on the region.

Asia is highly subject to natural disasters which significantly impacts the population: the Indian Ocean tsunami in 2004; the earthquake in Pakistan in 2005; and the Philippines landslide in 2006. There also appears to be evidence of prominent increases in the intensity and / or frequency of many of these extreme weather events.[23] Further, droughts, floods, and cyclones / typhoons occur with regularity. All of these weather-related events further impact a region already trying to cope with severe problems: a high proportion of low-income population that resides in low-lying areas that rely on low tech agricultural techniques for their survival. A key challenge therefore is how to strike a balance between mitigating climate change while populations and economies continue to rise.

The hardships of Asian people impacted by climate change could be reduced by increasing their adaptive capabilities mechanisms through institutional supports at various levels. Some of these coping mechanisms include climate focus development, mainstreaming of climate change into development planning and institutional reform.

Currently, Asian residents use a multitude of well-honed skills to cope with weather-related climate change. In a recent survey of residents in Bangladesh, India, and Nepal, residents typically relocate themselves to safer places or shelters, raise platforms within the household and rebuild their homes on stilts to escape flooding.[24] Longer-term solutions include the construction of flood resistant housing and floodwalls around the house, as well as keeping contingency funds nearby.[25]

Government has its role to play as well. Better coordination through early warning systems and regional cooperation appear to offer solutions on coping with climate change related events. Other potential solutions include a reduction of CO_2 emissions, less reliance on fossil fuels, developing and nurturing clean coal technologies, and increasing the use of nuclear energy. These solutions may not stop climate change, but they should go a long way in reducing the impact it has on the region for future generations.

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Index

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HK-031ENG-08

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