

CHAPTER 9

Energy Security and Climate Change: The Potential Role of China and India

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1. Introduction

Europe and Japan have been in the forefront of realizing the threat from climate change. They have adopted policies aimed at increasing energy efficiency and reducing their dependence on fossil fuels by developing alternative energy sources. The European Union's unilateral 20-20-20 pledge in 2007 is the most radical decision in the politics of climate change so far, with its aim to both significantly reduce emissions and increase the use of renewable energy sources. However, Brussels' ability to enforce the decision on the EU member states may depend on European diplomats' ability to get the USA, China, Russia and India on board in the global struggle to stop atmospheric warming. This is not just about getting these countries to stick to the Bali conference roadmap and sign a new protocol or convention when some 160 states send their negotiators to Copenhagen in 2009. The underlying challenge is to invest mind-boggling resources worldwide in research and innovation, and put new national, regional and global laws, regulations, finance mechanisms and enforcement institutions into effect. The double aim must be to make technological breakthroughs and drastically reduce the time-lag between the emergence of new clean technologies and their implementation as commercially viable solutions throughout the world. This will require significantly heightened crisis awareness, the formation of a forcefully influential epistemic community of business leaders, scientists, technicians, policymakers and politicians across all kinds of boundaries, and mechanisms ensuring the quick transfer of new technologies to every relevant location.

Some of the world's main political leaders have opened their eyes to the magnitude of the threat. A positive aspect of the challenge is that it could lead them to cooperate in fighting for a common purpose instead of rivalling each other for resources and power. However, this will require a fundamental change of policy, not just in Europe

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and Japan, but in the USA, China, Russia and India as well. This is the premise for the present chapter. After summarizing the evidence about the seriousness of the climate crisis, it puts forward two main arguments:

First, climate change, global energy security and the political situation around the oil-producing Persian Gulf are so strongly related to each other that they can no longer be discussed in isolation (Sharma and Noronha 2008). The provision of energy is at the core of the climate issue, and the energy markets are profoundly influenced by the political conditions around the Gulf, which led to insecurity of supply and wildly fluctuating prices. Hence, meteorologists, geologists, economists, historians, and political scientists should join forces in analysing the energy issue globally, and the world's political leaders must develop combined strategies for reducing greenhouse gas emissions, enhancing the security of the provision of energy to households, travelers and industries, and stabilizing the strategically important Middle East so the oil market can be more predictable. All at the same time.

Second, the leaders of the world's two main growth countries – China and India have a crucial role to play.² They could turn the threat from climate change into a political advantage for their nations by adopting new clean development strategies, and demanding full and rapid access to all such technologies that may allow them to quickly surpass the dirty stage of development. The Chinese and Indian leaders will no doubt continue to make the morally rightful point that the rich societies in Europe, North America and Japan must carry the main burden of reducing greenhouse gas emissions. The Europeans, Americans and Japanese have been polluting the atmosphere for many decades while the Chinese and Indians lived in poverty, and the rich countries have vastly higher emissions per capita than the inhabitants of these new growth countries. However, if the leaders in Beijing and New Delhi take into account that climate change will hurt their own societies badly unless something drastic is done on the global level, then they will not use the justice argument to absolve themselves of responsibility for setting targets and mobilizing their own societies for accepting drastic measures to reduce the use of carbons, but will instead demand that the rich countries make their capital and technologies available in massive programmes to clean up Asia's growth. This is actually what India did in the final phase of the climate negotiations in Bali in December 2007. It demanded hefty contributions from developed countries to reform the energy sector in developing countries, and this demand has become a central focus of the ongoing climate negotiations. China has since proposed that rich countries are to contribute a certain percentage of their GDP to finance emission reductions in developing countries.

² As a major oil and gas exporter, Russia has a similarly important, but different role. This, however, is not discussed in the present chapter.

2. The public diplomacy of climate change

The current climate negotiations began at the end of 2007. Since the Kyoto protocol was signed in 1997, there had never been so much public awareness of the threat from climate change as in 2007. Britain's Prime Minister at the time, Tony Blair, and former US Vice President Al Gore were front runners in drawing public attention to 'the climate crisis'. Al Gore's book and film 'An Inconvenient Truth' from 2006, which won an Academy Award (Oscar) for best documentary and best song in February 2007, awakened public opinion in many countries to the dangers of global warming and the essential role of scientists in establishing the facts, assessing probabilities, and bringing attention to the problem, so politicians can design solutions (*An Inconvenient Truth* 2006). Blair also contributed to putting climate change on the agenda by commissioning a report from the renowned economist Sir Nicholas Stern. The 700-page Stern report ('Review on the Economics of Climate Change'), which was presented to the British government in October 2006, argued that the world needed to invest 1 % of global GDP every year in order to mitigate the effects of climate change. Three elements of policy are required, he said, for an effective global response. The first is to increase the price of carbon, through tax, trading or regulation. The second is to support innovation and the deployment of low-carbon technologies. And the third is action to remove barriers to energy efficiency, and to inform, educate and persuade individuals about what they can do to respond to climate change. If this is not done, then up to 20 % of global GDP may eventually be lost because of the damage done by global warming. Stern claimed that climate change might become the greatest market failure ever seen. He warned that the effects of climate change might be as catastrophic as the two world wars and the economic depression in the first half of the 20th century (Stern Review 2006).

The Stern report has since received scathing criticism from Professor William Nordhaus at Yale, whose book *A Question of Balance* takes a less pessimistic view of the threat from climate change, and argues against excessively ambitious efforts to mitigate it. Nordhaus has made complex calculations to weigh the expected costs of climate change against the costs of policies to halt it, finding that the targets set in the Kyoto protocol, by Stern and notably Al Gore will lead to costs that by far outweigh the costs of climate change itself, which Nordhaus estimates will represent around 2.5 % of world output per year by the end of the twenty-first century. The main difference between the two economists' calculations stems mainly from the fact that Nordhaus discounts all future costs of climate change to their current value, while Stern finds it unethical to do so. While the comprehensive method used by Nordhaus to arrive at an optimal level of global mitigation investment is impressive from an academic viewpoint, his reasoning seems to suffer from several flaws. The first is his extremely long perspective. He discounts the damage costs of climate change three or more generations down the line to a relatively manageable current value, and finds it unreasonable

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that our generation is to carry a heavier burden than the future generations, who presumably will be much richer than we are. This is what Gore and Stern advocate, he says. The second flaw is that he bases his model on the assumption that the global temperature will not rise more than 3 degrees from the 1900 level (Nordhaus 2008: 70–72). Temperatures above that level would lead to damage of incalculable proportions since the West Antarctic Ice Sheet or Greenland Ice Sheet might melt. But then the very risk that the global temperature may rise to such a catastrophic level must strengthen Stern's ethical argument against discounting.³ A third flaw is that Nordhaus seems to operate on the assumption that the costs of climate change will be evenly distributed among the countries of the world or that there is a 'world economy' that will cover the damage costs. In fact, the damage will hurt some countries more than others, not primarily the richest ones, and there is no logic to the world economy ensuring that the resources used to adapt to the damage will be distributed in accordance with the distribution of the damage itself. Instead the poor will be left to suffer. All of this seems to strengthen Stern's ethical argument. It should be added, however, that Nordhaus also takes the threat from climate change seriously and presents a strong argument for governmental action to impose a *carbon price*: The price for carbon products must be adjusted upwards globally through taxation or a cap-and-trade system. In passing Nordhaus also mentions something he calls a 'low cost stop gap' scenario, with a significant technological breakthrough making it possible to provide emissions-free energy at competitive prices. This scenario, which would be more likely if the world's governments and companies invested heavily – meaning gigantically – in research and innovation, fascinated Nordhaus' reviewer in the *New York Review of Books*, Freeman Dyson, who thinks it may be possible to develop low-cost solar power, geothermal energy, nuclear hydrogen, some non-intrusive climatic engineering, or – notably – genetically modified carbon-eating trees (Dyson 2008). This chapter builds on the assumption that Stern is right and Nordhaus wrong.

Nordhaus made his criticism of Stern known already in 2006 (Nordhaus 2006), although it was presented much more comprehensively in his 2008 book. There was much increased climate awareness in the United States during the "climate year" 2007, also on the highest political level. Although President George W. Bush in his State of the Union address on 23 January 2007 focused primarily on US national oil security when speaking of energy matters, for the first time he paid serious attention to climate change, stating optimistically: 'America is on the verge of technological breakthroughs that will enable us to live our lives less dependent on oil. And these technologies will

3 Nordhaus explains (2006: 137–142) why he does not think the present generation needs to pay a 'risk premium': The risk of a catastrophic rise in the temperature will be higher the more economic growth there is in the world, and with high economic growth, future generations will be sufficiently rich to cover the costs.

help us be better stewards of the environment, and they will help us to confront the serious challenge of global climate change' (Bush 2007a).

One week later, on 12 February 2007, the United Nations Intergovernmental Panel on Climate Change (IPCC) published the first of four reports that year. The first one came from its Working Group 1 on 'the physical science basis,' which is responsible for making scientific assessments of the problem. It provoked widespread public attention with its virtual certainty as to the rapidity of global warming and that it is to a great extent caused by the burning of fossil fuels by humans. Working group 2, on 'impacts, adaptation and vulnerability' published its report on 6 April 2007, and on 4 May 2007 the report from working group 3 on 'mitigation of climate change' was released. The Climate Panel adopted and approved its synthesis report at its 27th session on 12–16 November 2007 in Valencia, Spain, leading to the publication of the synthesis report and full report on 17 November (IPCC 2007). The scientists operating under the auspices of the United Nations Environmental Programme and the World Meteorological Organisation thus did not give politicians any room for forgetting about climate change during 2007.

Shortly after the publication of the IPCC's first report in February, the EU launched its new strategy for greenhouse gas emission reductions, under the so-called 20-20-20 formula, which was formally adopted at the EU summit in Brussels on 8–9 March 2007. Its aim is to stabilize world temperature at 2 degrees above the pre-industrial norm. This is an ambitious aim that many scientists consider unrealistic. The EU's own contribution, in the period until 2020, will be to unilaterally reduce its own emissions by 20 % from the level in the base year 1990. By 2006 the EU had reduced its emissions by 7.7 % in relation to the 1990 level, but much of the reduction happened in the first years, with the dismantling of heavily polluting industries in Europe's least developed countries. There was no reduction in 2006 relative to 2005, and according to the European Environment Agency, countries like Poland, Denmark and Finland substantially increased their emissions (AFP 2008). The EU also committed itself to ensuring that at least 20 % of its energy consumption will come from renewable sources by 2020.⁴ Living up to these commitments will require a colossal effort. No agreement had been made before the adoption of the 20-20-20 decision as to how the burden would be distributed among the EU's member countries, and many national governments and companies are worried that they will lose edge vis-à-vis their competitors in America and Asia if Europe reduces its emissions more radically than others. If other countries join in the effort, the EU has pledged to go further and undertake a 30 % cut in its emissions before 2020. 'Other countries' here means mainly the USA, China, Russia and India. To obtain commitments from these four governments will

4 By contrast a much delayed draft for the fourth US Climate Action Report to the UN, which was leaked to the press in March 2007, predicted that US emissions would *increase* by 19 % from 2000 to 2020 (USA Today 2007).

require an intense diplomatic effort. In the first half of 2007, the EU was in a favourable position to influence global policies since its most environmentally advanced nation, Germany, had the 'double presidency' of the EU Council of Ministers and the G8 (WBGU 2006). Germany made climate change the main topic of the G8 summit in Heiligendamm on 6–8 June 2007. Not only the full members (Canada, Germany, France, Italy, Japan, Russia, UK, USA), but the five observers (China, India, Brazil, Mexico and South Africa) were present (G8+5). Optimists had hoped that the G8 would go beyond the declaratory stage, make genuine commitments and perhaps even design new institutional mechanisms to coordinate the effort of the great powers to overcome the climate crisis. This could have led to a 'concert of world powers' in overcoming the climate crisis. These optimists were disappointed. The formation of a global alliance to halt climate change was not possible, mainly because of US opposition. Shortly before the summit, on 31 May 2007, President George W. Bush made a speech in which he went further than before in pledging action to mitigate climate change, but he favoured an approach without emission caps, opting for an American-led process where the thirteen governments would consult each other over 18 months with a view to developing a consensus on intentional – not legally binding – goals for greenhouse gas emission reductions. Then, Bush argued, all the countries should design national strategies to meet their goals, and ask major industrial sectors to design 'best practices' (Bush 2007b). His aim was not a treaty, but a kind of voluntary engagement. The meeting in Heiligendamm, however, did arrive at a unanimous declaration, with a section on 'climate change, energy efficiency, and energy security,' seeing all three in combination and pledging:

We are committed to take strong leadership in combating climate change. We confirm our determination to work among ourselves and with the global community on global solutions that address climate change while supporting growth and economic development. We commit ourselves to implement approaches which optimally combine effective climate protection with energy security. To this end, we are committed to the further development of the international regime to combat climate change, especially in the run-up to the UN Climate Change Conference in Indonesia at the end of this year (G8 2007).

The last sentence meant that German Chancellor Angela Merkel had brought US President George W. Bush on board in the process to develop a global regime under UN auspices. This was her biggest triumph at the meeting, leading to an expectation that the negotiations that started under UN auspices in Bali in December 2007 were going to be serious.

In 2008, Japan took over the G8 presidency, and the declaration from the summit in Toyako 7–9 July 2008 went one step further than the one from Heiligendamm by setting "the goal of achieving at least 50 % reduction of global emissions by 2050" (G8 2008a). The leaders of Australia, Brazil, China, India, Indonesia, South Korea,

Mexico and South Africa were invited to a special meeting with the G8, and together they issued an additional declaration, without any specific target (G8 2008b). The two summits did not produce any significant results, but made declarations that could mean the world's nations intend, after all, to arrive at a new treaty or protocol by the time they meet in Denmark in 2009 to finalize the negotiations that started in Bali.

G8 is one of two global arenas for discussing global climate policies. The other is the annual conference under the UN Climate Convention framework created by the first Earth Summit in Rio de Janeiro in 1992 and renewed at the second in Johannesburg in 2002. The Kyoto protocol of 1997 resulted from this multilateral negotiation process, and is valid for the period until 2012. Many of those countries who have ratified the Kyoto protocol are finding it hard to live up to their obligations in terms of emission reductions, and their motivation suffers from the fact that the USA has refused to ratify the treaty and allowed major further increases in its CO₂ emissions. The USA's energy intensity is twice as high as Japan's – implying that Japan uses energy twice as effectively as the US.⁵ Negotiations for a follow-up to the Kyoto protocol should have started long before 2007, but there were repeated delays. The climate talks in Nairobi in November 2006 ended in failure. Until the last moment it looked as if the December 2007 conference in Bali would also fail. All parties to the Climate Convention (both those who have ratified and have not ratified the Kyoto protocol) took part. More than 10,000 representatives from over 180 countries were represented when conference secretary Yvo de Boer opened the proceedings on 3 December. It soon became clear that the EU would not get support from either Japan or the USA for its proposal to set a target of 25-40 % cuts in CO₂ emissions by 2020 for developed countries. The main conflict at the conference, however, was between the USA and the developing countries. The event turned into a diplomatic thriller when the head of the US delegation failed to commit to the draft for an agreed 'roadmap' after the EU had agreed to soften the language concerning the responsibilities of the developing countries (which notably meant China). However, after the conference had been extended by one day, from 14 to 15 December, the USA made a U-turn and accepted the roadmap. The risk of being diplomatically isolated compelled the Bush administration to endorse a document it did not actually agree with. For protagonists of globally respon-

⁵ According to the US Energy Information Agency, the total primary energy consumption in 2004 per dollar of GDP was 4,577 in Japan, while in the USA it was 9,376. However, since local costs are higher in Japan than the USA, if we adjust for purchasing power parities, the difference is smaller. In October 2007, the EIA switched to ppp adjustment, so the Japanese figure for 2005 was 6,538 while the US was 9,113 (EIA 2007a). Japan's greater energy efficiency is admittedly to a great extent explained by the fact that it is more densely populated than the USA and hence has lower transportation costs, and also by the fact that Japan has dismantled its most heavily polluting industry in order to reduce the need for imported oil. Instead it imports the products of such industries from other countries (like China and Australia) which have increased their emissions.

sible policies and multilateral cooperation, the roadmap was a partial victory. But the strong disagreements in Bali did not bode well for the struggle to reach a meaningful outcome when the negotiators meet in Copenhagen 2009, unless ~~the next American president~~ ⁷² departs radically from the policy pursued by George W. Bush, and China and India decide to assume more active and globally committed policies.

⁷² The Bali conference roadmap declaration acknowledged that evidence for the planet's warming is 'unequivocal,' and that delays in reducing emissions increase the risks of 'severe climate change impacts.' It also recognized that 'deep cuts' in global emissions will be required to avoid 'dangerous climate change.' It promised to look at 'a long-term global goal for emission reductions,' but did not set any targets or even agree that quantified, binding targets would have to be set in the future. Concerning the division of responsibility between developed and developing nations, it was said that developed nations are to take on commitments that are 'measurable, reportable and verifiable,' and 'nationally appropriate', while developing nations must take 'measurable, reportable and verifiable' actions 'in the context of sustainable development, supported by technology and enabled by financing and capacity-building.' This latter point is interesting since it opens the venue to global cooperation in financing and organizing the implementation of new clean technologies in China, India and other growth countries. The roadmap declaration also said it would be considered how to 'remove obstacles to' and provide incentives for scaling up the transfer of clean energy technologies from industrialized nations to the developing world (UNFCC 2007a; UNFCC 2007b; BBC 2007).

The world now waits to see if its leaders are able to negotiate a new protocol or convention in Copenhagen that combines elements of the three competing, but also complementary strategies we have seen unfold over the last ten years:

- The EU strategy of agreeing on national emission quotas as a basis for a system of quota trade, and of taxing the use of carbon-based end products. This strategy starts with legal commitments, on the assumption that it will be possible to find a way to comply.
- The US strategy of implementing positive incentive systems for technological innovation. This strategy aims to create the means through market incentives before legal commitments are made.
- The Chinese and Indian strategy of putting economic growth first and refusing to make any treaty-based commitments while looking for ways to combine rapid economic growth with increased energy efficiency.

When we evaluate these strategies, the main criterion must be their likely effects on the total level of the world's greenhouse gas emissions. We will then see that the three strategies are not alternatives, but complementary. Japan has a potential for playing a role in mediating between them, since it has a part in all three. Comparatively speaking, Japan has a quite energy efficient economy, due to measures undertaken already

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president
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in the 1960s–70s when Tokyo sought to reduce its dependence on imported oil. Japan is a ratifying party to the Kyoto protocol with a pledge to undertake costly emission cuts from an already low level. Japan is also a key partner for the USA in the Asia-Pacific Partnership on Clean Development and Climate (APP). Finally, Japan has engaged in a range of collaborative energy conservation projects with Chinese companies and institutions. If Japan could combine all of this with an effective multilateral negotiation strategy, Tokyo could become a key contributor to bringing the world beyond Kyoto, and indeed tried to do so during its G8 presidency in 2008. The overall improvement of Sino-Japanese relations during 2007–8 bodes well in this respect.

A rather promising sign at the beginning of 2007 was a statement from an informal meeting of high level political leaders from Japan, the USA and the G8 countries plus Brazil, China, India, Mexico and South Africa in the US Senate in Washington 14–15 February 2007, organized by the UK-based Global Legislators Organisation for a Balanced Environment (Globe International 2007). The meeting listened to a keynote address by Japanese national security advisor Yuriko Koike and, among others, to Senator John McCain, who in the following year became the Republican Party's nominee for the US presidency. The meeting agreed that both developed and developing countries have to face targets on greenhouse gas emissions, and also that a successor to the Kyoto protocol must be in place by 2009. Globe convened a new legislators' meeting for the G8+5 countries in the German Bundestag 3–4 June 2007 (immediately before the G8 summit) and held yet another in the Japanese Diet in June 2008, just before the G8 summit in Hokkaido. The task of the negotiators in Bali in December 2007, and in Denmark in 2009 is to reach agreement on a new, globally inclusive treaty protocol, with the USA, China, India and Russia as fully committed parties. Such a treaty will need to combine the European strategy, based on national emission quotas, the US strategy of creating incentives for technological change, and a developing country 'leapfrog growth strategy' with radical innovations in energy efficiency and alternative energy; a key element will be to agree on a globally applicable minimum carbon tax, which can divert investments away from the most polluting practices and raise revenue for the states concerned.

Much hinges on US internal politics and the question of whether or not the US president in the period 2009–12 will give real priority to climate change and energy security. No multilateral institution exists with a capacity to enforce a change of global climate policies. The decisive factor for a global turnaround is US policy. If the USA with its resourcefulness and innovative capacity makes a decision to prioritize the climate above everything else, then the world will follow. Campaign declarations by John McCain and Barack Obama during 2008 seem to give some hope that there could be a turnaround. In the campaign McCain formulated his principles as follows:

- Climate Policy should be built on scientifically sound, mandatory emission reduction targets and timetables.

Obama administration will be able to
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 both before and after his election.
 And Republican nominee John McCain also took the issue seriously.

- Climate Policy should utilize a market-based cap-and-trade system.
- Climate Policy must include mechanisms to minimize costs and work effectively with other markets.
- Climate Policy must spur the development and deployment of advanced technology.
- Climate Policy must facilitate international efforts to solve the problem (McCain 2008).

Barack Obama set his priorities as follows:

- Reduce carbon emissions by 80 % by 2050.
- Invest in a clean energy future.
- Support next generation biofuels.
- Set America on path to oil independence.
- Improve energy efficiency 50 % by 2030.
- Restore US leadership on climate change (Obama 2008).

In the US Senate, Joe Lieberman and John Warner were leading the effort in 2008 to obtain new global warming legislation (USA Today 2008).

Much of the credit for awakening US and world opinion to the threat from climate change must go to former Vice President Al Gore. In 2007, he followed up his prize-winning film with a whirlwind of lectures all over the world, and a new book entitled *Assault on Reason*. Together with the International Panel on Climate Change (IPCC), under its chair Rajendra Kumar Pachauri, Al Gore received the Nobel Peace Prize in Oslo on 10 December 2007, while the Bali conference was going on. Al Gore is controversial at home. Because he insisted that President Bill Clinton sign the Kyoto protocol in 1997 even though there was no hope of getting it ratified by the US Senate, Gore has been blamed for creating a stalemate situation in climate policies at US federal level. On the other hand, there would probably not have been any Kyoto protocol if Clinton had refused to sign. After the signing, with the US Congress refusing to ratify and entrenching itself in a do-nothing attitude, it was easy for President George W. Bush to ignore the climate crisis. Hence US innovative policies were developed only on the level of individual American states, such as California. At any rate Al Gore has become world famous as 'Mr. Green.' He has played a major role in raising the world's attention to the seriousness of the climate crisis.

3. How serious is the human-induced climate crisis?

This chapter is written by a peace researcher and historian, with no competence in climatology or natural science. What can be done here is just to summarize what seems to be the scholarly community's consensus position as far as climate change is concerned. The UN Climate Panel's reports and the publicly available scientific debates about them are the main sources.

There is no longer any doubt that the atmosphere is growing warmer and that the pace of global warming is increasing. Some scientists fear that the process has already gone beyond the danger level, and become irreversible. There is also no doubt that global warming is caused largely by the burning of fossil fuels (coal, oil, gas) and the change in land use (deforestation) is the other main contributing factor. Those who continue to claim that climate change may be due to natural variations in solar activity are a tiny minority. It also seems clear that global warming is putting both ecosystems and human societies at risk through the melting of ice, rising sea level, changes in rainfall patterns and in the flow of water through major river systems, perhaps also through increases in the frequency and severity of storms and hurricanes and the slowing and possible redirection of water currents.

What remains contested is *how* likely these risks are, how serious they will be, how the damage will be distributed among countries and regions, and the extent to which it is at all possible to slow down, halt or reverse global warming: Can efforts to reduce CO₂ emissions stop global warming? Is it possible to realize the often expressed goal of preventing the atmosphere from heating up more than two degrees Celsius? Will efforts to do so be cost effective, or would it be better to accept global warming as inevitable and concentrate on adaptation. This would mean moving millions of people away from areas exposed to floods or droughts, building dykes, irrigation systems and desalination plants on a massive scale. Some of these questions were addressed by the UN Climate Panel's working group 3, whose report was released on 4 May 2007 (IPCC 2007).

No matter what one's view is on the seriousness of the risk, and on the likelihood that measures to stop global warming may prevent the world temperatures from increasing by more than 2 or 3 degrees Celsius in relation to the pre-industrial level, there seems to be at least two strong reasons for taking urgent action. The first is *caution*. Just the *possibility* that global warming may continue to accelerate, and the enormous consequences this may have for mankind, seems ~~enough to be~~ a compelling reason for doing what we can to reduce the risk. This is the main reason underlying the recommendations in the Stern Review. And this is where Nicholas Stern disagrees with his critic William Nordhaus. The other reason is that many of the same measures that are needed to limit global warming will at the same time serve the purpose of enhancing energy security.

4. The quest for energy security

Due to the steep increase in the oil price during 2005, in part driven by instability in the Persian Gulf region, energy security topped the global political agenda in 2006, and anxiety about energy insecurity reached new heights later, with the price reaching unprecedented levels and the situation around the Persian Gulf remaining ripe with danger. Energy security was discussed at numerous bilateral and multilateral summits

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✓ in summer 2008, before it sharply fell,

in 2006, at a time when public attention to climate change was still quite low. Energy security was very much in focus when the International Energy Agency (IEA) released its *World Energy Outlook 2006* on 6 November 2006. The IEA's 2006 message was alarming and no doubt contributed to the continuing rise in the price for oil and gas in the following years. In the IEA's 'reference scenario' where the premise was a continuation of trends, it predicted that the world's total energy use would grow by more than half over the next 25 years, with *coal use* growing most in absolute terms. This would primarily be due to increased use of coal in China, which has grown at an alarming pace since 2002. Half of the projected increase in CO₂ emissions will come from new power plants, mainly using coal and predominantly located in China and India, said the IEA. China was at that point expected to surpass the USA to become the world's largest CO₂ emitter by 2009, but in 2007 it was reported that China had already surpassed the USA – although its per capita emissions of course remain much lower (Sydney Morning Herald 2007).

The use of oil would also according to the IEA rise substantially, and since the production of oil in non-OPEC countries is soon going to peak, the share of OPEC in world oil supply is bound to rise sharply. Within OPEC, oil production will also be increasingly concentrated in a few countries. Although gas resources are more widely dispersed, Russia, Qatar, and Algeria dominate the international market, with Iran a potentially huge provider if the necessary investments are made. In order to meet demand, investment needs in the period 2005–30 exceed USD 20 trillion of which USD 11.3 trillion are in electricity generation, USD 4.3 trillion in oil and USD 3.9 trillion in gas according to the IEA. It emphasized that its 'reference scenario' building on ongoing trends, would lead to a 'dirty, vulnerable and expensive energy system.' The *World Energy Outlook 2006* therefore also included an 'alternative policy scenario' with emphasis on investments in energy efficiency, renewables and nuclear power. Under the alternative scenario, consumers will have to pay substantially more for environmentally friendly products, but the investment needs in energy production will be so much lower that this more than compensates for the increased prices for end products. The IEA concluded that 'strong political will and urgent government action is needed to create clear incentives to change existing investment patterns' (IEA 2006). The following annual outlook from the IEA, released in November 2007, concentrated on China and India (IEA 2007). Together these two countries are likely to account for 45 % of the increase in global primary energy until 2030. Both countries' energy use is expected to more than double between 2005 and 2030. The use of coal is set to grow most rapidly, driven largely by power-sector demand. These trends lead to continued growth in global energy-related emissions of carbon-dioxide (CO₂), from 27 Gt in 2005 to 42 Gt in 2030 – a rise of 57 %. China is now the world's biggest emitter, while India is slated to become the third-biggest emitter by 2015. According to the IEA's baseline scenario, China's per capita emissions will almost reach those of OECD Europe by 2030.

The main forum for discussion of energy security, prior to the launch of the alarming *World Energy Outlook 2006* was the G8 summit in St. Petersburg 15–17 July 2006, building on the meeting at Gleneagles in Scotland in 2005. The St. Petersburg summit agreed on a comprehensive resolution on ‘global energy security,’ listing most of the measures needed under the following main chapters: Increasing transparency, predictability and stability of global energy markets; improving the investment climate in the energy sector; enhancing energy efficiency and energy saving; diversifying the energy mix (with emphasis on renewables); securing critical energy industry; reducing energy poverty; and ‘addressing’ climate change and sustainable development (G8 2006). The choice of the weak term ‘addressing’ in connection with climate change, and the emphasis on reducing ‘energy poverty’ by boosting the energy supply to developing countries reflected a Russian agenda. It is interesting to see the difference in the priorities expressed by the governments represented at the summit. Whereas the host, Russia’s president Vladimir Putin, emphasized the need to reduce investment risk by having long-term contracts between producers and consumers of oil and gas, Chinese president Hu Jintao took a comprehensive approach to the security of energy importers, advocating a range of measures seen as important from a demand perspective, and which are also inherently essential to the fight to halt climate change.⁶ The main problem with the summit in St. Petersburg was not the lack of attention to the climate crisis, but the fact that no commitments were made even in the field of energy security. Although the G8 pledged to ‘pursue energy security through a comprehensive and concerted approach,’ and spoke of a new ‘plan of action’ to supplement the ‘plan of action’ already agreed upon at Gleneagles, the G8 did not agree on any specific commitments. The International Energy Agency is said to have a key role in the G8 plan of action, but the IEA is just a centre of documentation and analysis with no power to implement policies. Implementation continues to depend on the policies of each individual government.⁷

6 Putin’s view was expressed most clearly in a speech to the G8 energy ministers on 16 March 2006: ‘One of the keys to global energy security is a fair distribution of the risks among energy resource producers, transit service providers and consumers. The energy market must be insured against unpredictability and its level of investment risk must be reduced. In other words, measures taken to ensure reliable supplies must be backed up by measures taken to ensure stable demand. In our view this is the optimum way to harmonize the interests of all the players on the energy market. To achieve this we must develop the corresponding instruments, in particular, long-term contracts between producers and consumers’ (G8 Information Centre 2006). Hu Jintao expressed his priorities in an outreach session during the G8 summit itself: ‘China’s energy strategy can be summarized as follows: Give high priority to conservation, rely mainly on domestic supply, develop diverse energy resources, protect the environment, step up international cooperation of mutual benefit, and ensure the stable supply of economical and clean energies’ (PRC MFA 2006).

7 For the IEA’s role in the G8 Plan of Action, see IEA Executive Director Claude Mandil’s talk ‘Bridging the Energy Gap,’ Monterrey, Mexico, 3 October 2006 (IEA 2006b).

At St. Petersburg, President George W. Bush's main satisfaction was to see agreement on a declaration concerning the threat from terrorism in the Middle East. In the remaining years of his administration, the rapidly rising oil price led him to become increasingly concerned by questions related to national energy security. It was much more accentuated in Bush's State of the Union address on 23 January 2007 than climate change:

Tonight, I ask Congress to join me in pursuing a great goal. Let us build on the work we've done and reduce gasoline usage in the United States by 20 % in the next 10 years. When we do that we will have to cut our total imports by the equivalent of three-quarters of all the oil we now import from the Middle East. To reach this goal, we must increase the supply of alternative fuels, by setting a mandatory fuels standard to require 35 billion gallons of renewable and alternative fuels in 2017 – and that is nearly five times the current target. At the same time, we need to reform and modernize fuel economy standards for cars the way we did for light trucks – and conserve up to 8.5 billion more gallons of gasoline by 2017. Achieving these ambitious goals will dramatically reduce our dependence on foreign oil, but it's not going to eliminate it. And so as we continue to diversify our fuel supply, we must step up domestic oil production in environmentally sensitive ways. And to further protect America against severe disruptions to our oil supply, I ask Congress to double the current capacity of the Strategic Petroleum Reserve (Bush 2007a).

It is important to distinguish between concern for national energy security and global energy security; although many argue that the latter is the key to the first. David J. O'Reilly of Chevron reflected the oil industry's global view when stating in March 2007:

When you are importing two-thirds of the oil we use and a lot of the gas we use, the best energy security is when the globe is secure. And I mean the globe secure holistically, broadly, as well as in an energy way. If you have any one of the major players on the demand or supply side that feels threatened or isolated, I think it's a bad thing for the globe. We are interdependent. We have gone way past the point of independence on anything (Mouawad 2007a).

This is also what national leaders tell each other when they meet at international summits, but when acting separately in relation to their domestic audiences, their most immediate concern is national energy security. This is the case even in Europe, where for example some members of the German government worry that they, by contrast to other European countries, do not have a national energy company to help get provisions in an emergency. While politicians often discuss national energy security in a narrow geo-political fashion, where it tends to be forgotten that energy security depends primarily on a functioning global market, the leaders of the EU, Japan and China are all aware that their oil security depends on the situation in the Gulf region, and the ability of Saudi Arabia, Iraq, Iran and the Emirates to pump increasing quanti-

ties of oil. While coal is the main problem in a discussion of climate change, the main energy security worries are related to oil and gas. Coal is to a great extent a national commodity. Few countries depend on import or export of coal. Concerns for purely national, as opposed to global energy security, thus tend to lead to emphasis on coal and nuclear energy. They are often seen as sources of security, while imported oil and gas create insecurity.

When discussing global energy security, there is no way to avoid the debate on 'peak oil.' A certain number of geologists and others as well, proceed from the obvious truth that the world's oil reserves are limited. We shall therefore sooner or later reach a peak, when it is no longer possible to further increase the global production. Oil exploration in the last couple of decades has brought few new discoveries, and no new substantial oil fields have been brought on-stream. If alternative sources of energy are not available on a sufficient scale when we reach the peak, the rich part of the world will be forced to radically change its way of life. The European, North American and Japanese way of life will at any rate be unsustainable if the Chinese and Indians are to enjoy the same way of life too (Deffeyes 2005; Roberts 2005; Areklett 2006; ASPO 2008). And those who will suffer most from rising prices are those with least purchasing power, the poor populations in the non-oil producing countries. Economists have refuted the 'peak oil theory,' arguing that the market forces will ensure global energy supply through investments and technological innovation driven by increases in the oil price. When the price gets to a certain level, it becomes increasingly rewarding to invest in more expensive oil production, reopening old fields to take out much of the 2/3 of the oil that was left in the ground when the field was operated, producing oil from the tar sands of Canada and other places, and notably taking out more coal. At the same time it also becomes more profitable to realize some of the elements in the IEA's alternative scenario and boost investments in energy efficiency, new transport technology and renewable energy. When the oil price exceeds a certain level, the demand for oil will automatically decrease as the energy demand is satisfied by coal, gas and other energy sources. The market forces will thus take care of a gradual transition from the oil age to a new era based on other energy drivers – with oil continuing to play an important, but diminishing role (Mouawad 2007b).

The main problem with the economic argument is that the oil price fluctuates so much and in such unpredictable ways that long-term investments in producing expensive oil and gas and developing alternative energy sources is fraught with financial risk.⁸ The oil price is not determined through a perfect interplay of supply and demand, since access to most of the world's oil reserves is controlled or dominated by national

8 The literature on the oil price is endless, but no one seems to have come near any ability to predict it accurately. Leonardo Maugeri (2006a) hails the high oil price and ventures to say that the price 'is unlikely to fall substantially in the short term and could even experience more spikes,' but Maugeri (2006b), only half a year later, warns of a possible price fall.

oil companies, and since the size of the reserves and the production capacity in Saudi Arabia and some other crucially important countries is uncertain.⁹ The oil price is also not controlled by OPEC, although OPEC policies sometimes affect it significantly. Investors in other energy sources have to consider the risk that the major oil producers can respond to a market challenge by pumping more oil and thus lowering the oil price.

This means that the market mechanism cannot be relied upon to generate the kind of investments needed to halt global warming and enhance global energy security. Just as the IEA says, there is a need for strong political will and urgent government action.

5. The geopolitics of national energy security

Concern for national oil security is as old as oil itself. Perhaps the best example of a country struggling with its oil security is Japan, since it has relied heavily on oil for more than a hundred years, and has no oil of its own. The US restrictions on oil exports to Japan in 1941 led Japan to consider whether it should widen its war in China to a war with the Soviet Union for access to Siberian oil or to a war with the Western colonial powers for control of the southeast Asian oilfields. With the attack on Pearl Harbor and the invasion of Malaya, Indonesia and the Philippines, Japan opted for the second strategy, and created a system of oil provision based on a short-lived naval supremacy in a 'Greater Asia.' With the US occupation after August 1945, Japan's resurrection as an industrial power relied on oil provided under US protection. Japan also sought energy security through diversification of its energy mix, nuclear power generation, and by entering into bilateral contracts with a number of nations for its provision of oil. After the 1973 oil crisis Japan did more than any other nation to invest in energy efficiency, and decided to dismantle its most energy intensive industries. However, Japan soon found that diversification of its oil supply through bilateral agreements with many oil exporting countries was costly, and hence found it preferable to rely on the global market and buy oil at the cheapest possible price. This led Japan to depend strongly on oil from the Gulf, and on US protection of the shipping route through the Hormuz and Malacca Straits and the South China Sea.

9 Simmons (2005) argues that Saudi Arabia has exaggerated its capacity for boosting its oil production and that its production is soon going to decline. Representatives of Saudi Aramco have since strongly argued that Saudi Arabia's actual reserves are much higher than the certified 'proven' ones and that the company will have the capacity to increase its production significantly for many years to come. Saudi Arabia has responded to the high oil price by making huge investments in exploration as well as in technologies that make it possible to extract more oil from existing fields. See also EIA (2007b), and Øystein Noreng's contribution to the present volume.

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In the last ten years, China has pursued a similar policy to that abandoned by Japan earlier. Although China continues to produce more than half of the oil it consumes, it has carried out a costly policy of constructing a long pipeline linking its market to the oilfields of Central Asia, invested a huge diplomatic effort in trying to persuade Russia to construct direct pipelines from the Siberian fields to China, and it has entered into long-term bilateral agreements on oil provisions from a number of countries around the world, notably in Africa. From 1989 to 2005, China increased from five to thirty-two the number of countries it bought oil from (Jakobson and Zha 2006: 63). In that year Angola became its largest provider of oil. As of 2004 China imported only 45 % of its crude oil imports from the Middle East, compared to Japan's 80 % and South Korea's 70 % (Calder 2006: 14). China does not of course have any military capacity to prevent the destruction of its pipelines in a time of war, or to protect the sea lanes from Africa to China, so it pays a certain 'premium' for creating a semblance of security. This is even more the case when we consider the investments that Chinese state-owned oil companies have made in oil production in many countries, with support from cheap state loans. Some oil concessions have been bought at a considerably higher price than anyone else would offer. Chinese oil companies have invested in many countries, but so far there is substantial oil production from Chinese-owned concessions only in three: Kazakhstan, Sudan and Angola (Downs 2006). While some security analysts in the West have seen China's oil diplomacy as threatening, experts on the oil market argue that China actually does the world a service by bringing oil to the market that would not have been produced without Chinese oil companies' costly investments. China thus contributes to lowering the oil price.¹⁰ India pursues some of the same policies as China in spite of its higher geopolitical security. India is closer to the Persian Gulf, has a naval presence in the Arabian Sea, and New Delhi enjoys more confident relations than Beijing with the trans-Pacific superpower.

Some Chinese analysts argue that their government should draw the same conclusion as Japan: Buy oil at the cheapest possible price, rely on the world market, and find common ground with other oil importers rather than forming its own bilateral relationships with individual exporters (Jakobson and Zha 2006). This argument is also heard in the USA, where calls for national energy security through greater self-reliance in energy, and diversification away from Middle Eastern oil are becoming increasingly difficult to ignore. As Chevron's David O'Reilly pointed out above, few countries have any prospect of being self-sufficient in oil. Among the major economies, only the UK is close: 'When you are importing two-thirds of the oil we use and a lot of the gas we use, the best energy security is when the globe is secure' (Mouawad 2007a). More

¹⁰ '... from the viewpoint of consumers in North America, Europe, and Japan, Chinese and Indian investment in the development of new energy supplies around the world is not a threat but something to be desired, because it means there will be more energy available for everyone in the years ahead as India's and China's demand grows' (Yergin 2006: 77).

recently, however, the national energy security argument has been reinforced by its confluence with concerns for the global environment. Many Americans have wondered why young Americans are to die in Iraq to ensure the provision of oil to Europe and Japan if the USA could instead produce its own bio fuel, create new jobs in refineries, and boost the value of its farmland.

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Since energy security has become such a prominent topic in international politics, it may be useful to see how global political alliance patterns relate to the producer-importer divide. The world's main oil-importing countries in 2005 were: USA (12.4 million barrels of oil a day), Japan (5.2), China (3.1), Germany (2.4), South Korea (2.2), France (1.9), India (1.7), Italy (1.6), Spain (1.6), and Taiwan (1.0). The main oil-exporting countries were Saudi Arabia (9.1), Russia (6.7), Norway (2.7), Iran (2.6), United Arab Emirates (2.4), Nigeria (2.3), Kuwait (2.3), Venezuela (2.2), Algeria (1.8), Mexico (1.7), Libya (1.5), Iraq (1.3), Angola (1.2), Kazakhstan (1.1) and Qatar (1.0).

The most important alliances and political partnerships among importers of oil are NATO, the US-Japan alliance and the strategic partnership between the USA and India. They are far more important than the International Energy Agency (IEA), which is mainly a research and documentation agency. If relations between India and China continue to improve, the Sino-Indian partnership will also be an alliance of importers. Oil importers have a shared interest in keeping up a functioning world energy market, but in a crisis situation, they may become rivals in the quest for access to resources. The often heard argument that China is threatening the functioning of the world market by securing bilateral deals with oil producing countries, thus reducing supply, is not valid. Firstly, oil produced by Chinese companies elsewhere in the world is normally sold on the open market so these companies can get the best possible price. Secondly, when oil produced in a Chinese-invested oil field abroad is brought directly to China, it is also paid for by the customers. And to the extent that customers in China acquire oil products at a lower price than the market price, this only hurts the company concerned or the government subsidizing the price, not the world market since the subsidized oil fills a demand that would otherwise be filled by market rate purchases. If the level of demand in the open market is reduced, it has no effect on the price level if the same amount of supply and demand are "taken out." The only advantage China can gain from taking oil out of the market is a false sense of security. It is false since in case of war, China's enemies could seek to stop its provisions of oil by destroying its pipelines and blocking the sea lanes. Only a small fraction of Chinese oil imports is carried on Chinese tankers.

Among the exporters, the 12-member OPEC is a more powerful and important organization than the IEA. It played a prominent role in the 1973-74 oil crisis but later lost some of its clout when more oilfields were opened in non-OPEC countries and the members disagreed among themselves on when to cut production in order to keep up the oil price. OPEC's importance is once more growing, since oil production has peak-

ed, or is about to peak, in most non-OPEC countries, while some central OPEC countries still have huge reserves. OPEC was further strengthened when Angola, a major new oil producer, joined the organization in 2006. OPEC's share of the global oil market is poised to increase from 35 % to more than 50 % in coming years. OPEC's capacity to agree internally is difficult to predict. The organization has a strong interest in preserving oil's role as a major strategic commodity. It therefore has a natural interest in keeping the oil price relatively high, but not so high that it becomes profitable to develop new technologies with a potential for eliminating oil dependence. The enormous increase in the oil price during 2008 did not occur by OPEC's design. OPEC is a natural adversary not only for consumers and international, private oil companies, but also probably in the fight to halt climate change.

Iran and Russia's cooperation in the field of nuclear energy is another example of a partnership between energy producers. Russia has also had talks with the leaders of the other main gas exporters Qatar and Algeria, leading at one point to speculation that Russia might aim to establish a 'gas cartel' (America.gov 2007).

If we move back to oil, another important alliance of energy producers is the Cooperation Council for the Arab States of the Gulf (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the UAE), which was founded in Riyadh in 1981, and aims to establish a common currency by 2010. Iraq and Iran are not members of the Council.

If we move to alliances and partnerships that cut across the export-import divide, thus forming complementary relationships, the most important one is the special relationship between the USA and Saudi Arabia, dating back to the establishment of diplomatic relations in 1933 and President Franklin D. Roosevelt's historic meeting with King Abdul Aziz Ibn Saud on his way back from Yalta in February 1945. Much of today's global energy security hinges on this alliance between an autocratic Islamist monarchy and the world's dominant liberal democracy, based on US provisions of sophisticated weaponry and on the Saudi state's role as a swing producer for the oil market. The relationship came under severe strain after the first Gulf War, with the establishment of US military bases on Saudi territory, and the 11 September 2001 terrorist attacks against New York and Washington. A majority of the terrorists were Saudis aiming to put an end to the US presence in the land of the two holy places Mecca and Medina. The war in Iraq has represented a new challenge to the Saudi-US alliance. A high proportion of the suicide bombers in Iraq have been young Saudis (Hegghammer 2007). The war in Iraq has also tended to weaken US leverage in the region and strengthen the influence of Iran. This worries the Saudi kingdom, which has assumed a more independent role in regional diplomacy. The ongoing weakening of the US commitment to stabilizing the Middle East has led to talks about a possible regional power balance between Iran and its allies Syria and Hezbollah on one side and Saudi Arabia, Egypt, Jordan and the smaller Arab Gulf states on the other. However, the internal stability of the Middle Eastern states may also be threatened by the way the income from the high oil price is being amassed by wealthy elites while the

labouring classes (often immigrants) are suffering from ~~increased food and energy prices, and~~ widespread unemployment. There is a danger, says Kenneth Pollack, that the ~~rising~~ revenues are being spent in ways that will "worsen the region's instability over time. And that's a problem, because problems in the Middle East have a bad habit of becoming big problems for the rest of the world" (Pollack 2008)

Japan, with its almost complete reliance on imported oil, has been cautious in its approach to the Middle East, but has generally supported US policies. It has not, however, followed the US policy of applying unilateral sanctions against Iran. Japan is the world's largest importer of Iranian oil and has also invested in the Iranian oil sector. The EU countries have pursued diverging policies in the Middle East, with the UK supporting the USA, while France and Germany have maintained relations both with Iran and the former regime in Iraq in defiance of US policies. The difference came to a fore in the dispute over the US invasion of Iraq in 2003 and, since then, in debates over what to do to prevent Iran from developing the know-how and capacity for building nuclear weapons.

The emerging powers China and India have strengthened their ties with the various Middle Eastern countries, but have not so far wielded much influence (Jin 2005; Leverett and Brzezinski 2006). To a lesser extent India, have a presence in the world, through the oil and gas producing states and agreements with oil producers.

In the game of strategy, the Middle East is traditionally important, but has caused much international tension. The European market form an energy corridor from Siberia to northeast China and Korean markets, are expensive pipeline from the West. Western dependence on oil has contributed to the oil line would need to deal with Indian rivalry over pipelines with Bangladesh. Pipeline construction may also provoke military and terrorist attacks. What we see is a situation that no one

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fore contribute to enhancing global energy security through a functioning world market. This was the message from the G8 meeting in St. Petersburg 2006. The other trend emphasizes increased national energy security in response to the ~~high~~ oil price and to a fear of depending too heavily on provisions from the highly volatile Gulf region.

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This has provoked much discussion of the military aspects of energy security (Klare 2008; Moran and Russell 2009).

6. Peace risk and war risk in the Middle East

According to the *Oil and Gas Journal's* estimate from 1 January 2007, five countries in the Middle East have 739 of the world's 1,119 billion barrels of proven oil reserves: Saudi-Arabia 262, Iran 136, Iraq 115, Kuwait 102, Emirates 98 (EIA 2007c). Their oil is cheap to produce, but the sector suffers from under-investment and inefficient management. Production from the biggest oil fields is decreasing, although new technologies make it possible to extract more oil than hitherto from each field, and open up closed fields to more production. The oil sector in the Middle East is controlled by state monopolies. They – particularly Saudi Aramco – may still probably increase their production in the coming years. If the situation in Iraq should stabilize, or if Iran should arrive at an agreement with the UN concerning its uranium enrichment and open ties with the USA, then this could lead to a new wave of investments in the oil and gas sector of countries with huge and easily exploitable reserves. A draft law on hydrocarbons has long been debated by Iraq's parliament. Meanwhile, the UN sanctions levied against Iran because of the controversy over Iran's uranium enrichment make it urgent for the Iranian government to attract foreign investments and adopt more investor-friendly policies in its oil sector. If there should be commercial breakthroughs either in Iraq or Iran, then this could once more lower the oil price and render investments in coal, energy efficiency and alternative energy – as well as coal – unprofitable throughout the world. Paradoxically we may call this a *peace risk*.

On the other hand, the war and civil war in Iraq, the remaining possibility of an Israeli aerial attack against Iran, which could lead to sabotage against oil installations and shipping in the Hormuz Strait contribute to driving the oil price ~~further~~ up, and thus boost investments in coal, energy conservation and alternative energy. This may be called the *war risk*. Both the peace and the war risks are already playing a role in investors' calculations. The irony of the matter is that the peace risk tends to prolong the era of cheap oil and thus delay action to stop global warming whereas the war risk contributes positively to boost the kinds of investments needed to stop global warming and enhance global energy security (but also the use of coal).

Attempts to secure the supply of oil to the global market through military interventions of the Iraqi kind are likely to fail. On the other hand, a strategy to reduce dependence on Middle Eastern oil by investing heavily in other sources of energy may provoke the oil producing countries to manage their internal and external conflicts in ways allowing them to pump significantly more oil.

This is only ~~one of the~~ moral and political dilemmas that need to be faced when world leaders seek to form an energy ~~policy~~ strategy. ~~Another dilemma relates to coal.~~

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7. The role of the USA

The struggle to develop globally responsible climate policies depends on the construction of an influential epistemic community across the boundaries of nations, regions, industries, ideologies, religions, academic disciplines – and interest groups. On the level of politics an alliance will be needed among several constituencies, most notably in Europe, Japan, USA, China, India and Russia. The first big question is what the next US president will do. How far will John McCain or Barack Obama go towards adopting the kind of policies that Al Gore has been advocating? If they want to generate public support for new policies, they must appeal not only to the environmentalist lobby, but also to those concerned by US national security, to the business community, and to everyone's concern for their private economy in a time of recession, and quite notably to farmers producing biofuel. The latter has become deeply problematic with the role the switch to biofuel production in the USA has had for the hike in world food prices. But the agro industrial segment in the USA has strong influence in many states, and hence great impact on decisions in the US Senate.

The next US President is unlikely to introduce new taxes, although the imposition of a carbon tax would be beneficial not just by increasing the competitiveness of non-carbon products, but also by contributing much needed revenue to the US federal and state budgets. The next president may also be tempted to delay setting caps on CO₂ emissions in the way the EU has done. He will probably continue to encourage American farmers to contribute to national energy security by producing crops for biofuels. This is not just important for the farmers, but also for the workers in the new refineries. Regardless of its effect on the world food prices, biofuel has indeed provided a boost to US agriculture. The US President may also argue, on the basis of experience from California and from the Chicago Climate Exchange, that carbon quota trade provides a market-based solution that is suited to resolving the climate crisis by channelling investments in the right directions. If, through an agricultural and market based strategy, American politicians are able to put in place the mechanisms needed to carry out a major transformation of the US energy system, then the emission caps and treaty based obligations may follow – at a time when they are not seen as quite so consequential as they are today. And when that time comes, since it is the US Senate that ratifies all treaties, and since the agricultural states are over-represented in the Senate, it will be crucial to have the biofuel lobby on the President's side.

A key problem in such a political strategy is to get liberal proponents of environmental responsibility, conservative proponents of national security, farmers and labour

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unions wanting jobs in new refineries to work in the same direction. The two main ways of reducing CO₂ emissions are to increase demand-side energy efficiency and to de-carbonize power generation. Trade with quotas may contribute to both if quotas are sufficiently expensive. There are strong arguments both from a climate change and energy security perspective for further boosting energy efficiency. The quest for efficiency pulls technological innovation, and thus appeals to universities and knowledge-based companies. The production of biofuels has a potential for reducing oil expenditure in the transport sector, and once the biofuel industry is strong enough – as it is in Brazil – it will form a lobby that is likely to favour taxes on carbon-based fuel.

8. Can coal be part of the solution?

The biggest problem remains coal. The USA has abundant reserves of coal, and so has China. From a national energy security perspective it is tempting to maintain and even increase the role of coal in power generation. This enhances national security, but is the worst one can do for the climate – unless clean coal technologies are applied with secure carbon sequestration. Today these technologies remain prohibitively expensive, but this could change.

The Norwegian government and the state-owned company StatoilHydro have an ambitious project to build a full-scale CO₂ capture and storage project at a gas power plant at Mongstad. The first stage of the project covers a CO₂ capture testing facility which will be operational at the same time as the power plant becomes operational in 2010. The test facility/pilot plant will have the capacity to capture at least 100 000 tonnes of CO₂ per year. The second stage, i.e. full-scale capture of approximately 1.5 million tonnes of CO₂ per year, is planned to be in place by the end of 2014 (MPE 2008). This 2014 deadline has been politically controversial in Norway.

The US company American Electric Power (AEP) announced in March 2007 that it plans to build a pilot coal-fired plant with sequestration of CO₂ already in 2008, and have a fully commercial plant ready by 2011. In November 2007, AEP announced that the German RWE AG, the largest electricity producer in Germany, had agreed to collaborate with AEP and Alstom during a planned validation of commercial-scale application of carbon capture and storage technology on the coal-fired power plant they are building (AEP 2007a; AEP 2007b).

In this context, it may be seen as promising that President Bush in his 2007 State of the Union address pointed at the same remedies for enhancing energy security as those needed to resolve the climate crisis:

Extending hope and opportunity depends on a stable supply of energy that keeps America's economy running and America's environment clean. For too long our nation has been dependent on foreign oil. And this dependence leaves us more vulnerable to hostile regimes, and to terrorists – who could cause huge disruptions of oil shipments, and raise

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the price of oil, and do great harm to our economy. It's in our vital interest to diversify America's energy supply – the way forward is through technology. We must continue changing the way America generates electric power, by even greater use of clean coal technology, solar and wind energy, and clean, safe nuclear power. We need to press on with battery research for plug-in and hybrid vehicles, and expand the use of clean diesel vehicles and bio diesel fuel. We must continue investing in new methods of producing ethanol – using everything from wood chips to grasses, to agricultural wastes (Bush 2007a).

He did not say greater use of coal, but of 'clean coal technology'. With the horrific contribution that coal-fired power plants are making to global warming, it is of critical importance that the USA, China and India stop constructing new power plants based on dirty coal technology and use new clean technologies instead. This does not just require the technology as such; a whole system of safe deposits and a legal framework needs to be put in place. This will be extremely expensive, so it represents an immense hurdle for humanity, but once a system is in place, innovation will lead to cost reductions. Technological cooperation in this field between the USA, China and India, as well as Germany and Japan is essential. The Chinese coal industry is posited to be the worst contributor to global warming in the years to come.

This leads us to the third ~~political~~ dilemma.

9. China and India's right to development

Since Europe, North America and Japan have benefited for many years from access to cheap oil and since they still use far more energy, and emit much more greenhouse gases per inhabitant than other parts of the world, they must take main responsibility for reducing ~~the world's greenhouse gas~~ emissions. However, today the most cost-effective investments in energy efficiency can be made in the most energy-intensive countries. This means mainly Russia and China, but also India.¹¹ India consumes less energy per output unit than China and Russia because of its large primary and tertiary sectors, and its relatively small industrial sector. However, the high population growth in the northern part of India contributes to increased use of energy and thus also to higher emission levels.¹² In order to mitigate climate change, we need both a substan-

11 The total primary energy consumption in 2004 per dollar of GDP using market exchange rates is reported by the US Energy Information Administration as: Russia 91,490, China 39,760, India 25,989. These figures may be compared with Japan's 4,577, Germany's 7,764 and USA's 9,336. (If we use purchasing power parity figures, the picture becomes very different: Russia 15,763, China 9,080, India 4,205, Japan 6,532, Germany 7,175, and USA 9,336 (EIA 2007a).

12 For the role of population growth in rising CO₂ emissions, see Engelman (undated).

tial reduction in CO₂ emissions in the rich countries and an immediate shift away from the energy intensive growth model that is being pursued in China, Russia and India. China's energy intensity has actually already been reduced, with the introduction of modern technologies, measured in energy used per unit produced.¹³ Still there is an enormous scope for further reduction in China's energy intensity, notably through increased energy efficiency. The Chinese government reported in 2006 that it had failed to meet the target set in its 5-year plan of increasing energy efficiency by 20 % by 2010. This would require a 4.4 % increase per annum. China failed to achieve this in both 2006 and 2007, but ~~there is hope of reaching~~ the annual target in 2008 (Reuters 2008).

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Massive investments in energy conservation must be made in both developed and developing countries simultaneously. It is furthermore clear that the rich countries are morally responsible for covering not only the cost of their own substantial emission cuts, but also much of the investment needed to stop the emissions increase in China, India and other developing countries so they can shift to an energy efficient growth model. If China and India stick to their present models of growth, then anything the rich countries do to reduce their CO₂ emissions will be offset by growing emissions in China and India. On the other hand, if China and India shift priorities and manage to stabilize their emissions, then the rich countries will still have to carry out enormous emission cuts if the increase in world temperature is to be stabilized at +2 or +3 degrees Celsius relative to the pre-industrial level. If we need, say, a global cut of 60 % by 2030, and India and China go only as far as to stabilize their emissions at the present level, then the rest of the world must cut their emissions by far more than 60 %. What this demonstrates is, firstly, that it is unacceptable to argue that developing countries should be exempted from setting caps on their emissions. While this may seem justified from a moral point of view, taking into consideration that the rich countries have already emitted far more than their moral share, a higher morality must apply that takes the interest of humanity as a whole as its point of departure. Secondly, it is equally evident that the rich countries cannot buy freedom from heavy emission cuts by funding energy efficiency projects in developing countries. They must both cut drastically at home and invest heavily in helping developing countries to skip the dirty phase of development.

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The EU member states, the USA and Japan are cooperating with China in the field of energy conservation, and have taken part in implementing so-called Clean Development Mechanisms (CDMs) so their own companies can obtain emission quotas by funding projects to cut emissions in China. The informal meeting of political leaders from the G8+5 countries in Washington 14–15 February 2007 stated a need for 'programs focussing on capacity building, access to technology and financial incentives

¹³ The reason for the fall in energy intensity has been much debated (Zhang 2003; Hu undated).

– to help developing countries invest in more efficient and low carbon technologies' (Globe International 2007). CDMs need to be developed on a much greater scale than hitherto, in relation to many developing countries, also to Russia, and they must be incorporated into a strict global system of treaty-based emission cut levels, trade in *expensive* quotas and rapid implementation of new technologies worldwide. Companies certifying CDMs need to work under a system of reliable international auditing. Efficient mechanisms need to be put in place to drastically reduce the time lag from innovation to global implementation. The EU and the USA have adopted different strategies to get the large Asian growth countries on board in the struggle to reduce emissions, and Japan is a partner in both strategies. The EU has opted for strict national quotas, grounded in the 1997 Kyoto protocol, and an emissions trading regime with CDMs.

In 2005, the USA joined in creating the Asia-Pacific Partnership on Clean Development and Climate (APP or AP6) with emphasis on stimulating voluntary measures to generate technological change and innovation.¹⁴ The two strategies are often seen as contradictory, but could be complementary. The US focuses on the means needed to attain what the EU seeks to impose through legal commitments. The EU and Japan are also engaged in APP-like measures through their bilateral cooperation with Asian growth countries, and several states in the USA (California, New Mexico, a group of states in northeastern USA, have experimented with quota trade). The main difference between the EU and US strategies is that the EU begins with political decisions and takes for granted that companies and member states will find ways to reduce emissions when obliged by their governments to do so, whereas the US seeks to first induce industry through various market incentives to develop the means to cut emissions so political constituencies can be created, which at a later stage will make it possible to mobilize political will. Optimists believe in a healthy competition between the two strategies. Pessimists think the Europeans and Americans will fight over their differences in ways that allow both to refrain from undertaking the actions needed. The big problem is that we probably do not have the time to wait and see if one or the other system works. At the International Studies Association convention in Chicago on 2 March 2007, a research group from Yale University characterized global warming as a 'super wicked problem' because it combines three features: 1) The problem is so urgent that there is no time to make mistakes and learn from them along the way; 2) There is no central authority to implement the necessary action; and 3) The consequences of failure may be catastrophic.

¹⁴ Many commentators have dismissed the APP initiative as a smokescreen for doing nothing, but it has at least created an institutional mechanism for doing something if the political will should emerge. The APP was taken seriously at a panel organized under the International Studies Association (ISA) Convention in Chicago on 3 March 2007, where three papers were presented (Heggelund 2007; Kanie 2007; Skodvin and Andresen 2007).

They also fear that it will take too much time to put a global quota trade system in place, and therefore think it would be better for the EU, China and the USA to agree on an immediate tax on the production of fossil fuels at source.

One positive contributing factor would be if India and China changed their attitudes and adopted a proactive strategy of their own in the fight to stop global warming. Although China disappointed many by not adopting any new targets in the National Climate Change Programme it issued shortly before the G8+5 summit in June 2007, this plan strongly recognized the seriousness of the threat from climate change. This may augur well for further positive change in the Chinese attitude, although China played a less than constructive role at Bali (Hindu 2007; NDRC PRC 2007). Chinese and Indian spokespersons often argue that climate change is caused primarily by the Western countries since they have a much higher energy use per capita; it is therefore unreasonable to expect the Chinese and Indians to limit their economic growth in order to help save the world. This attitude may perhaps be overcome. Chinese and Indian scientists and politicians realize that global warming will hurt them no less, or even more, than the Europeans, Americans and Japanese, and some developing countries, such as Bangladesh, will suffer tremendously.

This realization calls for a proactive strategy, with China and India aiming for a clean growth model, and demanding of the developed countries that they pay much of the cost and make their most advanced technologies available. Might it not be an idea for India and China to establish a number of ambitious Environmental Innovation Parks (EIPs), each concentrating its research and innovation on one or a few aspects of the portfolio of measures needed to halt global warming: Energy conservation in households and public buildings; clean coal; renewables; natural gas; urban planning aimed to reduce the need for transportation; non-polluting systems of transportation; quota trade; efficient government monitoring of energy use? China and India could demand that the first and second generations of industrialized countries in Europe, America and Asia (Japan, South Korea, Taiwan and Singapore) pay most of the initial cost for these EIPs, and make their technologies and scientists available. Patent systems must not be allowed to hinder or delay the utilization of environmentally friendly technologies, so patents need to be bought through international finance mechanisms so they can no longer hinder the spread of key technologies. The setup of EIPs might hasten the pace of technological change in the world's least energy efficient countries, provide Chinese and Indian companies and universities with great opportunities, and create a significant scientific constituency in support of environmentally friendly policies. So far the Chinese and Indian responses to the UN Climate Panel's reports have not impressed by being innovative or globally responsible.

10. Conclusions

To stop global warming and ensure global energy security, enormous investments are required in energy conservation and alternative energy. Still these investments may be smaller than those needed to sustain the world's current energy system. The IEA's

World Energy Outlook 2006 spoke of an investment need of USD 20 trillion before 2030 if there is no change in policies. If more sensible policies are adopted, leading to higher energy efficiency, the investment need will be somewhat smaller, and be directed towards multiple sectors rather than just electricity generation, oil, gas and coal (IEA 2006a).

While most of the cost of resolving the climate crisis and enhancing global energy security must be carried by the developed countries, who have long benefited from carbon-based economies, emission targets must be set as soon as possible for developing countries as well, and the most cost-effective investments can be made in Russia, China and India.

Since the means to stop global warming and ensure global and national energy security are largely the same, it may be possible to develop a global epistemic community and forge the political alliances needed to carry out drastic action not just in Europe, but in the USA, China and India as well, provided that the responsible leaders refrain from seeking to enhance their national energy security by resorting to increased use of coal-fuelled power plants without any clean coal technology. This is clearly happening now.

Three main measures are needed as part of a worldwide strategy to mitigate climate change and enhance energy security. They are not alternatives, but form part of a necessary package. The first is a treaty-based minimum carbon tax, to be levied by all governments in the world, who can retain the revenue themselves; tax-based negative sanctions against the burning of fossil fuels are needed everywhere. The second is a globally applicable system of national caps on CO₂ emissions and trade in sufficiently expensive quotas to stimulate technological change. And the third is massive positive incentives for investing in technological research, innovation *and implementation* of clean technologies, both in the large economies that have the greatest innovative capacity in this field (Japan, USA, EU) and in the major growth countries where investments in energy efficiency are most cost-effective: Russia, China, and India. In addition there is an urgent need for planning how to *adapt* to climate change. Global warming is happening. The temperature cannot be kept at its present level. Damage has already been done, and is bound to become more serious. The sooner one starts implementing precautionary measures and the sooner one sets up plans for how to handle crises, the better.

Although in some ways disappointing, the Bali conference 3-15 December 2007 should be seen as a call to act. Japan is a key player, and the EU must coordinate its action with Japan, which has significant access points both in the USA and China. Japan hosted the negotiations leading to the Kyoto protocol in 1997. It used its G8 presidency in 2008 to build on the work done by Germany in 2007. This led to the establishment of a Partnership for energy efficiency, in which China, South Korea and Australia are also included. The G8 also agreed to set up a new clean energy investment fund, to be managed by the World Bank. And the G8 countries signed up to the

goal of a global reduction in CO₂ emissions by 50 % before 2050. The target should have been set for 2030, and the G8 countries should have pledged to undertake the reduction regardless of what the rest of the world does. Still Japan's G8 presidency must be said to have brought us a step forward. ~~The question is now if Italy can follow up as G8 host next year.~~ The world needs to get beyond the declaratory stage, shape new institutional frameworks, or provide existing multilateral institutions with the necessary funding and authority to effectively coordinate the global effort to stop global warming and ensure global energy security. The scientists on the UN's Intergovernmental Panel on Climate Change (IPCC) have proved their worth as a collective whistle-blower – and they got the Nobel Peace Prize for their effort. Yet no similarly impressive institution exists to coordinate the necessary action.

Success will depend on the ability of the USA and the EU to overcome their differences and launch healthy competition in the field of environmental innovation. China and India could play on the trans-Atlantic rivalry, not by using it to skirt away from their own obligations, but by drawing American, European and Japanese companies into innovative projects in their own countries. China and India could assemble such projects in ambitious Environmental Innovation Parks (EIPs), built in collaboration with Japanese, American and European institutions and companies. Smaller, advanced Asian countries like Singapore and South Korea might also be given a role in such parks. Chinese and Indians need to overcome their tendency to argue defensively that a problem created by the West must be resolved by the West. They will themselves be harmed and may serve their own interests better by adopting a proactive attitude: Advocate emission cuts through energy conservation and the use of alternative sources of energy, and demand of the rich countries that they pay most of the price and make their most advanced technologies available.

Success of course also depends on governments adopting a mind-set where national energy interests are interpreted in the wider and longer-term context of economic interdependence and climate change. What is required is a conception of energy security that is global and local rather than national. Much effort can be wasted on attempts to foster national energy security through increased use of coal, measures to boost domestic production of oil and gas, and the production of oil from tar sands, and the construction of nuclear plants. By contrast, efforts to enhance local energy security through efficient use of renewables are strongly called for. And a common global conception of energy security, with emphasis on stabilizing the energy markets and channelling investments into sustainable kinds of energy production, may contribute both to international cooperation and the mitigation of climate change. Energy is indeed a strategic resource, but in a more acute and fundamental sense than envisaged by the proponents of classical geopolitics.

References

- AEP, American Electric Power (2007a): AEP to install carbon capture on two existing power plants; company will be first to move technology to commercial scale (15 March). Accessed on 18 May 2008 from <http://www.aep.com/newsroom/newsreleases/>
- AEP, American Electric Power (2007b): RWE to join AEP in validation of carbon capture technology (8 November). Accessed on 18 May 2008 from <http://www.aep.com/newsroom/newsreleases/>
- AFP, Agence France Presse (2008): EU CO₂ emissions drop 7.7 percent from 1990 levels: EAA (28 June). Accessed on 17 July 2008 from <http://afp.google.com/article/ALeqM5iDrEc-c3tKvzg-tqna8mA4vqoJzzQ>
- Aleklett, Kjell (2006): Oil: a bumpy road ahead, *World Watch* (1 January).
- America.gov (2007): U.S. Energy Secretary Bodman Calls Natural Gas Cartel a Bad Idea (15 February). Accessed on 18 May 2008 from <http://www.america.gov/st/washfile-english/2007/February/20070215165316saikceinawz0.1187403.html>
- An Inconvenient Truth* (2006). Accessed on 17 May 2008 from <http://www.climatecrisis.net/>
- ASPO, Association for the Study of Peak Oil&Gas (2008): Peakoil.net. Accessed on 18 May 2008 from <http://www.peakoil.net/>
- Bailes, Alyson J.K., Pál Dunay, Pan Guang and Mikhail Troitskiy (2007): *The Shanghai Cooperation Organization*. SIPRI Policy Paper 17 (May).
- BBC (2007): US Sets Terms for Climate Talks (15 December). Accessed on 18 May 2008 from <http://news.bbc.co.uk/2/hi/science/nature/7145608.stm>
- Bush, President George W. (2007a): State of the Union (23 January). Accessed on 11 May 2008 from <http://www.whitehouse.gov/stateoftheunion/2007/index.html>
- Bush, President George W. (2007b): President Bush Discusses United States International Development Agenda (May 31). Accessed on 18 May 2008 from <http://www.whitehouse.gov/news/releases/2007/05/20070531-9.html>
- Calder, Kent (2006): *China's Energy Diplomacy and its Geopolitical Implications*, The Edwin O. Reischauer Center for East Asian Studies Asia-Pacific Policy Papers Series 3.
- Deffeyes, Kenneth S.(2005): *Beyond Oil: The View from Hubbert's Peak*. New York: Farrar, Straus and Giroux.
- Downs, Erica (2006): *China*. The Brookings Foreign Policy Studies Energy Security Series (December).
- Dyson, Freeman (2008): The Question of Global Warming. *The New York Review of Books* 10/55 (12 June).
- EIA, Energy Information Administration (2007a): Table E.1p: World Energy Intensity (posted 1 October). Accessed on 18 May 2008 from <http://www.eia.doe.gov/pub/international/icalf/tablee1p.xls>
- EIA, Energy Information Administration (2007b): Country analysis brief on Saudi Arabia (February). Accessed on 11 May 2008 from http://www.eia.doe.gov/emeu/cabs/Saudi_Arabia/pdf.pdf

- EIA, Energy Information Administration (2007c): World Proved Reserves of Oil and Natural Gas, Most Recent Estimates. Table posted 7 Jan 2007. Accessed on 17 July 2008 from <http://www.eia.doe.gov/emeu/international/reserves.html>
- Engelman, Robert (undated): Global warming and the third world. Population, consumption and equity, *Tiempo*. Accessed on 11 May 2008 from <http://www.cru.uea.ac.uk/tiempo/floor0/recent/issue30/t30a2.htm>
- G8 (2006): Joint declaration on Global Energy Security (16 July). Accessed on 18 May 2008 from <http://en.g8russia.ru/docs/11.html>
- G8 (2007): Growth and Responsibility in the Global Economy, G8 Summit Declaration (7 June). Accessed on 18 May 2008 from <http://www.whitehouse.gov/g8/2007/g8agenda.pdf>
- G8 Information Centre (2006): Vladimir Putin's Speech at Meeting with G8 Energy Ministers (16 March). Accessed on 18 May 2008 from http://www.g7.utoronto.ca/energy/energy_putin060316.html
- G8 (2008a): Hokkaido Toyako Summit. Environment and Climate Change. Declaration of 8 July. Accessed on 17 July 2008 from http://www.g8summit.go.jp/eng/doc/doc080709_02_en.html
- G8 (2008b): Declaration of Leaders Meeting of Major Economies on Energy Security and Climate Change (9 July). Accessed on 17 July from http://www.g8summit.go.jp/eng/doc/doc080709_10_en.html
- Garver, John W. (2006): *China & Iran. Ancient Partners in a Post-Imperial World*. Seattle: University of Washington Press.
- Globe International (2007): Washington Legislators Forum Statement, 14-15 February. Accessed on 18 May 2008 from http://www.globeinternational.org/docs/content/washington_statement.pdf
- Heggelund, Gørild M. (2007): China's Participation in the Asia-Pacific Pact: Future Emissions Reductions under the Kyoto Protocol Less Likely? Paper presented to the International Studies Association (ISA) Convention. Accessed on 5 June 2007 (no longer accessible 11 May 2008) from <http://www.isanet.org/chicago2007/program.html>
- Hegghammer, Thomas (2007): Saudi militants in Iraq: Backgrounds and recruitment patterns. Report from the Norwegian Defence Research Establishment (FFI) (5 February).
- Hindu (2007): China unveils action plan to combat climate change (5 June). Accessed on 11 May 2008 from <http://www.hindu.com/2007/06/05/stories/2007060503391300.htm>
- Hu, B. (undated; no full name): An Analysis of Energy Intensity in China, Sydney, Macquarie University. Accessed on 11 May 2008 from <http://www.mssanz.org.au/modsim05/papers/hu.pdf>
- IEA, International Energy Agency (2006a): *World Energy Outlook 2006*. Accessed on 18 May 2008 from <http://www.worldenergyoutlook.org/>
- IEA, International Energy Agency (2006b): Bridging the Energy Gap. Address by Claude Mandil, Executive Director (3 October). Accessed on 18 May 2008 from <http://www.iea.org/Textbase/speech/2006/mandil/monterrey.pdf>

Moran, Daniel and James A. Russell, eds (2009):
Energy Security and Global Politics. The
militarization of Resource Management.
London: Routledge.

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- IEA, International Energy Agency (2007): *World Energy Outlook 2007. China and India Insights*. Accessed on 18 May 2008 from <http://www.worldenergyoutlook.org/>
- IPCC (2007): International Panel on Climate Change Fourth Assessment Report (AR4). Accessed on 18 May 2008 from <http://www.ipcc.ch/>
- Jakobson, Linda and Zha Daojiong (2006): China and the Worldwide Search for Oil Security, *Asia-Pacific Review* 13 (2), pp. 60–73.
- Jin Liangxiang (2005): "Energy First. China and the Middle East," *Middle East Quarterly* 12 (2), no page numbers. Accessed on 17 July 2008 from <http://www.meforum.org/article/694>
- Kanie, Norichika (2007): Japan's Climate Policy, Diplomacy and Perceptions of the Kyoto Protocol and the Asia Pacific Pact, paper presented to the International Studies Association (ISA) Convention. Accessed on 5 June 2007 (no longer accessible 11 May 2008) from <http://www.isanet.org/chicago2007/program.html>
- Kolås, Åshild and Stein Tønnesson (2006): Burma and its neighbours: The geopolitics of gas, *Austral Policy Forum* 0630-A (24 August). Accessed on 11 May 2008 from <http://nautilus.rmit.edu.au/forum-reports/>
- Leverett, Flynt and Jeffrey Bader (2005): Managing China-U.S. Energy Competition in the Middle East, *The Washington Quarterly* 29 (1), pp. 187–201.
- Li Shaoxian and Tang Zhichao (2007): China and the Middle East, *Contemporary International Relations* (published by China Institute of Contemporary International Relations) 17 (1), pp. 22–31.
- McCain, John (2008): John McCain's Principles for Climate Policy. Accessed on 18 May 2008 from <http://www.johnmccain.com/Informing/Issues/a3bbd02f-42c3-4df3-b21f-3b2bbc-cf1eb7.htm>
- Maugeri, Leonardo (2006a): Two Cheers for Expensive Oil, *Foreign Affairs* 85 (2), pp. 149–161
- Maugeri, Leonardo (2006b): That Falling Feeling, *Newsweek* (9 October). Accessed on 6 July 2007 from <http://www.msnbc.msn.com/id/15081350/site/newsweek/page/0/>
- Mouawad, Jad (2007a): Saturday interview [with David J. O'Reilly] Big Profits, Big Worries, *New York Times*, Section C, p.3, column 1 (3 March).
- Mouawad, Jad (2007b): Oil Innovations Pump New Life Into Old Wells. Industry Finding Ways to Extend Supplies, *New York Times*, Section A, p. 1, column 5 (5 March).
- MPE, Norwegian Ministry of Petroleum and Energy (2008): Carbon dioxide capture and storage in Norway. Accessed on 18 May 2008 from <http://www.regjeringen.no/en/dep/oed/Subject/Carbon-capture-and-storage/Carbon-Dioxide-Capture-and-Storage-in-No.html?id=451454>
- NDRC PRC, National Development and Reform Commission, People's Republic of China (2007): China's National Climate Change Program. Accessed on 18 May 2008 from <http://www.ccchina.gov.cn/WebSite/CCChina/UpFile/File188.pdf>
- Nordhaus, William (2008): *A Question of Balance. Weighing the Options on Global Warming Policies*. New Haven: Yale University Press.

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Klare, Michael T. (2008): Rising Powers, Shrinking Planet. The New Geopolitics of Energy.
New York: Henry Holt.

- Obama, Barack (2008): Obama'08. The Blueprint for Change. Accessed on 18 May 2008 from <http://www.barackobama.com/issues/energy/>
- Pollack, Kenneth (2008): How the Middle East wastes its oil wealth. *International Herald Tribune* 15 July, p. 8.
- PRC MFA, People's Republic of China Ministry of Foreign Affairs (2006): Hu Jintao's address at the G8 Outreach Session (17 July). Accessed on 18 May 2008 from <http://www.fmprc.gov.cn/eng/wjdt/zyjh/t264261.htm>
- Reuters (2008): China may hit energy use target for 1st time in 08 (25 February). Accessed on 11 May 2008 from <http://www.reuters.com/article/environmentNews/idUSPEK4633820080226>
- Roberts, Paul (2005): *The End of Oil: On the Edge of a Perilous New World*. New York: Mariner Books.
- Sharma, Devika and Ligia Noronha, eds. (2008): *Energy, Climate, and Security. The Inter-linkages*. Proceedings of the 2nd TERI-KAS Conference. New Delhi: Konrad Adenauer Stiftung (KAS) Publication Series No. 19.
- Simmons, Matthew S. (2005): *Twilight in the Desert: The Coming Saudi Oil Shock and the World Economy*. Indianapolis: John Wiley.
- Skodvin, Tora and Steinar Andresen (2007): The Asia Pacific Partnership on Clean Development and Climate: Supplement or Alternative to the Kyoto Protocol? Paper presented to the International Studies Association (ISA) Convention. Accessed on 5 June 2007 (no longer accessible 11 May 2008) from <http://www.isanet.org/chicago2007/program.html>
- Stern Review on the Economics of Climate Change (2006). Accessed on 17 May 2008 from http://www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/sternreview_index.cfm
- Sydney Morning Herald (2007): China overtakes US as top CO₂ emitter (20 June). Accessed on 18 May 2008 from [http://www.smh.com.au/news/World/China-overtakes-US-as-top-CO₂-emitter/2007/06/20/1182019182449.html](http://www.smh.com.au/news/World/China-overtakes-US-as-top-CO2-emitter/2007/06/20/1182019182449.html)
- Tønnesson, Stein (2007): The Case for a Pro-Active Indian and Chinese Approach to Climate Change and Energy Security, *Strategic Analysis*, 31 (3), pp. 417–445.
- UNFCCC, United Nations Framework Convention on Climate Change (2007a): Conference of the Parties, Thirteenth Session (3-14 December), Agenda Item 4. Accessed on 18 May 2008 from http://unfccc.int/files/meetings/cop_13/application/pdf/cp_bali_act_p.pdf
- UNFCCC, United Nations Framework Convention on Climate Change (2007b): The United Nations Climate Change Conference in Bali. Accessed on 18 May 2008 from http://unfccc.int/meetings/cop_13/items/4049.php
- USA Today (2007): Report Projects US Emissions to Rise (3 March). Accessed on 18 May 2008 from http://www.usatoday.com/news/washington/2007-03-03-emissions-report_N.htm
- USA Today (2008): Senate poised to take up sweeping global warming bill (17 May). Accessed on 17 May 2008 from http://www.usatoday.com/news/washington/environment/2008-05-17-global-warming_N.htm

- WBGU, German Advisory Council on Global Change (2006): *New impetus for climate policy: making the most of Germany's dual presidency*. Berlin: WBGU Policy Paper 5 (21 December).
- Wu Lei (2003): Middle East Oil and East Asian Energy Security. *The Middle East and East Asia* (Institute of West Asian and African Studies, Chinese Academy of Social Sciences), pp. 105–116.
- Yergin, Daniel (2006): Ensuring Energy Security, *Foreign Affairs*, 85 (2), pp. 69–82.
- Zhang Zhong Xiang (2003): Why Did the Energy Intensity Fall in the Chinese Industrial Sector in the 1990s? The Relative Importance of Structural Change and Intensity Change. Honolulu: East West Center Working Papers 55 (January). Accessed on 11 May 2008 from <http://www.eastwestcenter.org/fileadmin/stored/pdfs/ENVwp055.pdf>