FRIEDRICH EBERT STIFTUNG

德国 艾伯特基金会

Shanghai Coordination Office
for International Cooperation

BRIEFING PAPER
SHANGHAI

February 2012 | No. 13

Major Turning Points of International Energy Policy: China's Key Role

Friedemann Müller

1. Introduction

Almost every day the public is told about the need to decarbonise energy consumption and thus to change energy intensity and the energy mix. Hundreds of conferences take place to discuss aspects of the transition process. Public awareness of the problem as a whole, however, reveals major deficiencies. The impact of climate change and resource scarcity, the rapidly growing energy demand of emerging economies and the wrong signals emitted by markets, which are oriented towards monopolisation and politicisation, and also the interests of resource countries, energy exploiting companies and customers, all influence the structures that have to be changed in order to usher in decarbonised energy consumption. The costs involved run to hundreds of billions of dollars each year and the future of billions of people is at stake. But is change going in the right direction, what else could be done to support it and what role is China playing?

The failure of the climate summits in Copenhagen (2009), Cancun (2010) and Durban (2011) to agree on a successor contract for the Kyoto Protocol strengthened a tendency in many countries and regions – including China and Europe – to argue: if we cannot find a global consensus on how to solve the problem of climate change we should work towards a solution at home. It is better to do one's utmost at home on all levels – regional, enterprise, community and family, but also in terms of research, development and investment – than to wait for a comprehensive international agreement which cannot be achieved in the foreseeable future.

Unfortunately, this strategy leads us into a dead end. It excludes the major problem of the tectonic shift currently taking place. China and other Asian countries, with a total population of about three billion, are developing economically at extremely high speed to catch up with the industrialised world (roughly one billion people). However, there are insufficient resources to provide all human beings with a standard of living like that in the industrialised countries, with their current resource consuming structure, nor can all the greenhouse gases being emitted by these countries be absorbed. On the other hand, no power in the world can hinder the emerging economies in their attempts to catch up. We have to deal with this problem of how to interest the developing world in taking a different development path from the one taken by the industrialised countries in the twentieth century. This is the main challenge of creating a sustainable energy structure in the decades to come.

Dr. Friedemann Müller, energy expert in Munich, is a former head of the research division "Global Issues" at the German Institute for International and Security Affairs (SWP), Berlin, and project director of the "International Network To Advance Climate Talks (INTACT)". As an economist he received his PhD from Freiburg University.

2. The Problem

The need to change global energy consumption rests mainly on two resource problems. First, estimates of energy supply up to 2035 indicate that global demand for oil will far exceed supply if the emerging economies adjust to the current energy mix and energy intensity (energy consumption per GDP unit) of industrialised countries. Second (the larger of the two problems), the greenhouse gas (ghg) concentration in the atmosphere is growing dramatically in terms of the history of the ecosphere. At the beginning of industrialisation (around 1800), like the previous thousands of years, this concentration was measured as close to 280 ppm. It has now risen to about 390 ppm, with a strong upward trend. All relevant states and regions – including China, the United States, the European Union, Russia and the OPEC countries – signed the UN Framework Convention on Climate Change (UNFCCC) two decades ago at the UN conference in Rio de Janeiro (1992). In Article 2 the signatory states committed themselves:

> to achieve...stabilization of greenhouse gas concentration in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. (United Nations 1992)

This »ultimate objective« of the convention was concretised at the Fifteenth Conference of Parties of the Climate Convention in Copenhagen (2009) by the 2^0 Celsius commitment, which means that the global average temperature must not increase by more than two degrees in order to prevent dangerous interference with the climate system. A two-degree temperature rise corresponds to a cap on ghg concentration at 450 ppm.

In 1988, the United Nations founded the Intergovernmental Panel on Climate Change (IPCC) as a global scientific body. It is obliged to present an assessment report every five or six years reflecting the state of play concerning the progress of climate change and the options for mitigating it. According to current knowledge, the growth of global ghg emissions must be stopped before 2020 and, after that, a decline to about 50 per cent of the emissions of 2000 must be achieved. The most prestigious government institution of the Western industrialised world, the International Energy Agency (IEA), writes in the foreword of its 2011 World Energy Outlook:

> Carbon emissions are already »locked in« because of the nature of the plant and equipment which we continue to build. If we do not change course, by 2015 over 90 per cent of the permissible energy sector emissions to 2035 will already be locked in. By 2017, 100 per cent. We can still act in time to preserve a plausible path to a sustainable energy future; but each year the necessary measures get progressively tougher and viciously more expensive. (IEA 2011: 4)

Among the five (direct) greenhouse gases CO_2 is by far the most important. It contributes more than 60 per cent of the anthropogenic increase of ghg concentration. CO_2 is part of natural circulation supporting the growth of plants by photosynthesis, on the one hand, and combustion, on the other. Supposing the stock of plants (particularly forests) remains unchanged, this circulation will remain in balance. If, however, oil, natural gas and coal (fossil energy), withdrawn over hundreds of millions of years from the ecosphere, is pumped back into it within a few hundred years it leads to a significant increase of the ghg concentration in the atmosphere. Oil, natural gas and coal are not exclusively but mainly used for energy production: 81 per cent of current energy consumption is based on fossil fuel. Methane, the second most important ghg, is also partly connected with energy production. All in all, roughly 65 per cent of all anthropogenic ghg emissions are due to energy consumption.[1] This makes the correlation between energy consumption and climate change obvious. There is, however, also an obvious correlation between energy consumption and economic prosperity. The denial of prosperity as an objective in a democratic society can hardly be realised. To that extent, the transition of the energy sector must rely on the following three instruments:

- energy saving (for instance, through building insulation);
- increasing energy efficiency (higher mileage for automobiles);
- reducing the share of fossil energy in the energy mix in favour of renewables or nuclear energy.

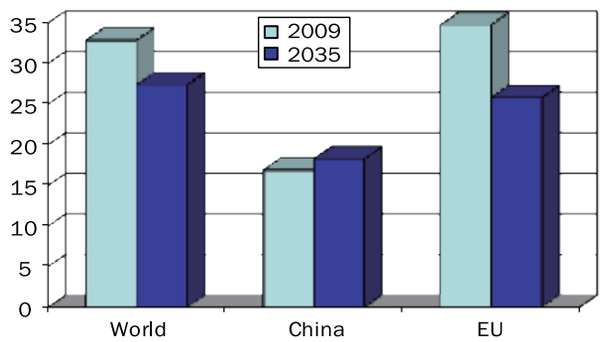
[1] Other ghg emission generating sectors are mainly agriculture (14 percent) and cutting forests (18 percent). (Stern 2006: iv)

In industrialised countries such as Germany, much effort is being concentrated on all three options. This has to do with the country's level of prosperity and technical opportunities, but also the degree of saturation of, for example, the number of automobiles per capita. This does not apply in the case of developing countries and emerging economies. These countries wish to emulate the prosperity of the industrialised countries before they modify the energy structure in order to reduce ghg. This would be linked to high costs, for instance to substitute coal power stations in China by renewable energy. Furthermore, the most modern technology is often not available to increase efficiency or to shift from fossil to renewable energy. To that extent, responsible management of the climate problem must produce differentiated incentives, taking into account differences in the development stages of industrialised countries, on the one hand, and of emerging and developing economies, on the other. This was the idea behind the Climate Convention but the Kyoto Protocol interpreted it in a way that courted disaster.

3. The Global Energy Mix – Current Situation and Trends

Fossil energy accounts for 81 per cent of total global energy consumption at present. The fossil share in the EU's energy supply is »only« 74 per cent. The lower figure does not mean a higher share of renewables, however: 10 per cent of the EU's energy mix is renewable energy, less than the 13 per cent global average. Nuclear energy, however, has a significantly higher share in the EU (14 per cent) than globally.[2] In China, however, the fossil share in the energy mix is 87 per cent. Even under the conditions of the »new policy« scenario the International Energy Agency expects only a decrease to 81 per cent in 2035. Given likely energy consumption growth in China of 69 per cent until 2035 this is an alarming development.

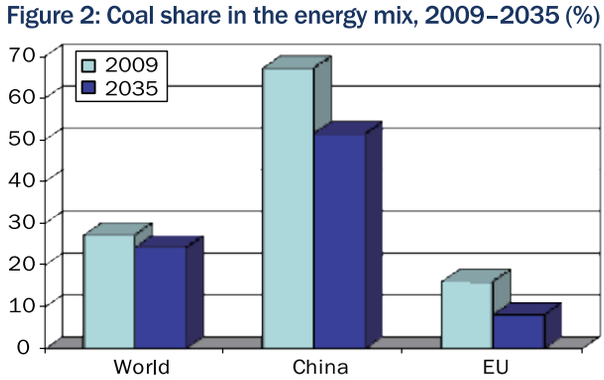
Figure 1: Oil share in the energy mix, 2009–2035 (%)



Source: Author's calculation based on IEA (2011): new policy scenario.

Oil is currently – and will remain so for at least a quarter of a century – the most important energy carrier. Its liquid form and high energy density make it suitable for any use, be it a power station or heating system and, most of all, it can be put in any tank. Its attractiveness and virtual non-substitutability for the transportation sector make it indispensable. This is why the gap between demand and supply of oil might open up in a dangerous way. Many developing countries and emerging economies – most of all China – need fast growing oil imports in order to catch up with the industrialised world (Figure 1). Therefore, the share of oil in the global energy mix will remain high in spite of the specific sensitivity of the supply situation.

Figure 2: Coal share in the energy mix, 2009–2035 (%)

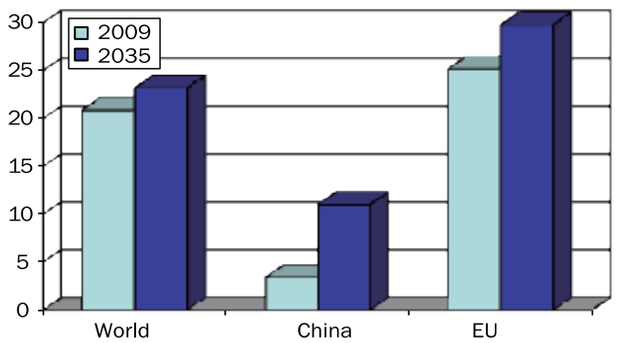


Source: Author's calculation based on IEA (2011): new policy scenario.

[2] The source of these and the following data is (IEA 2011). The International Energy Agency (IEA) is a government agency of the Western industrialised countries. Its World Energy Outlook, published every year in November, provides consistent data on countries/regions, energy carriers and time periods, as well as production and consumption. Data on future energy production and consumption are not prognoses but scenarios. The IEA offers three scenarios: the »current policy« scenario, extending current policy into the future; the »new policy« scenario, which reflects a realistic improvement of the political framework conditions supporting the transition to a more sustainable energy structure; and finally the »450 scenario«, which is a normative one: how must the energy structure be changed in order to adjust to the objective of a maximum 450 ppm ghg concentration in the atmosphere.

Coal remains the second most important energy carrier, although it urgently needs – as by far the highest ghg emitter per energy unit – to be substituted by an energy carrier with lower emissions. According to the IEA, coal in China will still have a more than 50 per cent share in the energy mix in 2035 (Figure 2).

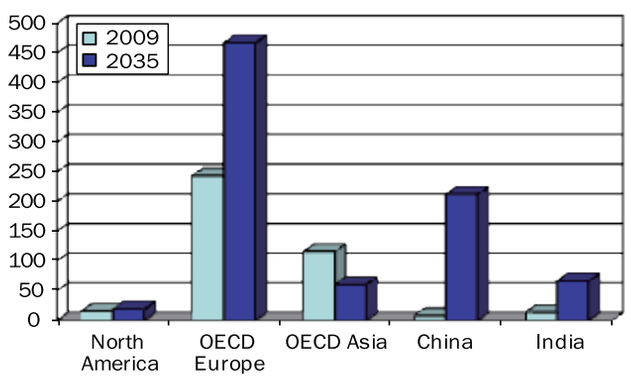
Figure 3: Natural gas share in the energy mix, 2009–2035 (%)



Source: Author's calculation based on IEA (2011): new policy scenario.

Natural gas, the cleanest fossil energy, will enjoy an increasing share in the global energy mix. This will apply particularly to China but also to Europe (Figure 3).

Figure 4: Natural gas imports of major consumer regions, 2009–2035 (billion cubic meters)



Source: Author's calculation based on IEA (2011), pp. 159, 165.

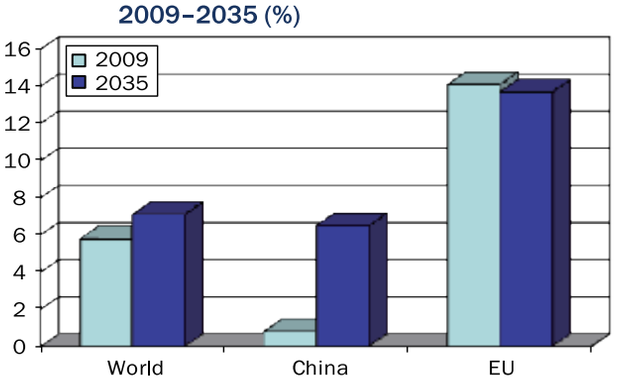
The international natural gas market, different from the oil market, is more or less split into three regional markets, due to the higher transportation costs. The North American market is almost a self supplier. The European market is mostly supplied by Russia, but also from North Africa. The East Asian market is served by liquefied natural gas (LNG) tankers from Australia and South East Asia. While the North American market will remain an almost closed market (Figure 4) the European and East Asian markets might grow a little more together since Russia and the Caspian region want to supply both markets and LNG transportation from the Middle East (primarily Qatar) will gain market share. LNG, different from pipeline transportation, is flexible with regard to the shipment destination.

Europe is particularly dependent on Russia. This has less to do with the fact that Russia is the world's biggest single reserve holder and producer of natural gas: there are more natural gas reserves in the South Caspian/Gulf region than in Russia, and located no further away from Central Europe. It has more to do with an accident of history that during the 1970s, when Europe's demand for natural gas grew and an import transportation network was needed, the détente policy of the time took the opportunity to link the Soviet Union with Europe economically. The world's largest international natural gas infrastructure was thus constructed. The costs played a minor role for the Soviet Union since long-term contracts were signed which provided the opportunity to pay back the loans for construction through natural gas deliveries. Since the infrastructure is already in place, it must be used and it is profitable at least for the pipeline owner, Russia. Even the second biggest supplier of Europe, Algeria, has built up a major pipeline infrastructure to link Europe to Algeria, even though some Algerian gas is shipped to Europe by LNG tankers. There is, however, no pipeline linking the biggest natural gas region in the world, the Caspian/Persian Gulf, with Europe (the largest import market). Discussions on this question are never-ending, as are negotiations on a pipeline link from the South Caspian region to Europe (Nabucco pipeline project and others).

It is worth noting that Europe (EU or even OECD Europe, including the sixth largest natural gas producer Norway) imports more than all other world regions together and, following the IEA projection, this is expected to be the case even in 2035 (Figure 4). Given that Europe is the biggest natural gas market place in the world and also its favourable geographical position, with 70 per cent of global conventional natural gas reserves located within a circle of less than 5,000 km around Central Europe,

which can be reached by pipeline, the diversification of imports is totally inadequate. Instead of organising a competitive market structure the dependence on Russia is overwhelming, particularly in the eastern regions of the EU, which technically cannot be supplied from the Western regions.

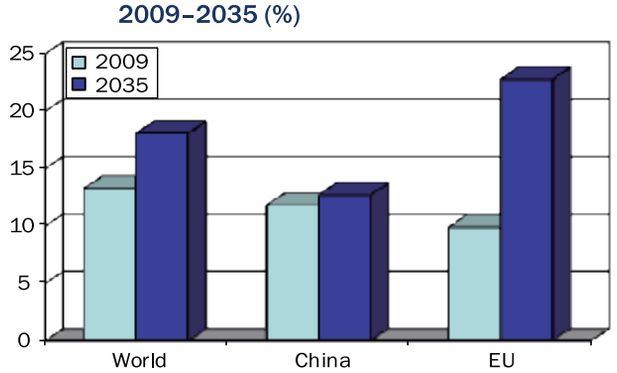
Figure 5: Nuclear energy share in the energy mix, 2009–2035 (%)



Source: Author's calculation based on IEA (2011): new policy scenario.

The role of nuclear energy in current world supply or its future role in the changed energy structure is often overestimated. The current share in the global mix is less than 6 per cent and it would be difficult to increase it to 8 per cent or higher (Figure 5). The situation is different in China and India where nuclear energy should substitute a significant share of the coal now used in power stations. However, the resulting share would not be above 10 per cent of global energy production.

Figure 6: Share of renewables in the energy mix, 2009–2035 (%)



Source: Author's calculation based on IEA (2011): new policy scenario.

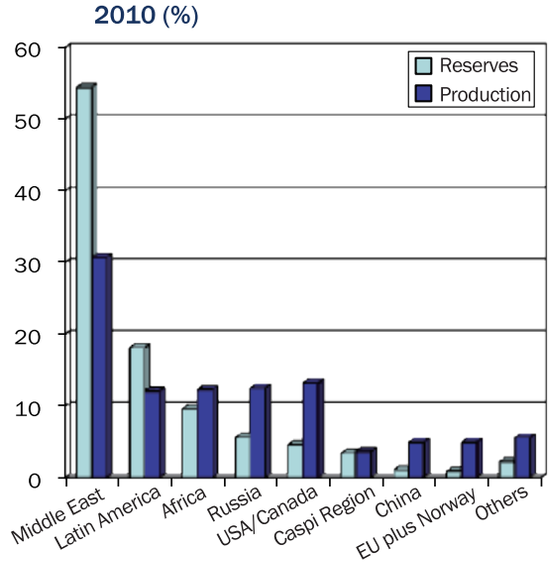
As far as renewable energy is concerned it is to be expected that in Europe its share in the energy mix will more than double. This will not be emulated by the rest of the world, however (Figure 6). Nevertheless, an increase from 13 to 18 per cent in global energy production seems feasible. This means that renewable energy, starting from a higher level, will have higher growth rates than nuclear energy.

4. Oil: Fragile Security of Supply

Due to its technical ability to serve any energy demand, particularly mobile energy consumption, oil is the most attractive energy carrier. Since its production costs have been (more than) competitive in comparison to other forms of energy production, oil not only became the most important energy carrier in quantitative terms but also has been wasted, considering the scarcity of reserves and externalised costs, such as emissions (polluting the air in cities and the atmosphere with ghg), but also those of securing the flow of oil to the world market by military means and other political costs. This waste also reflects carelessness with regard to insecurity of supply. The problem of oil supply is not so much a matter of the approaching production peak. The »peak oil« discussion is an ongoing and fruitless one because the question of when the global production peak will happen is uncertain. It depends on a number of factors influenced by human interests. The major problem, however, derives from the coincidence of three almost totally inflexible factors.

First, the already high concentration of oil reserves will increase further.

Figure 7: Shares of world oil reserves and production, 2010 (%)



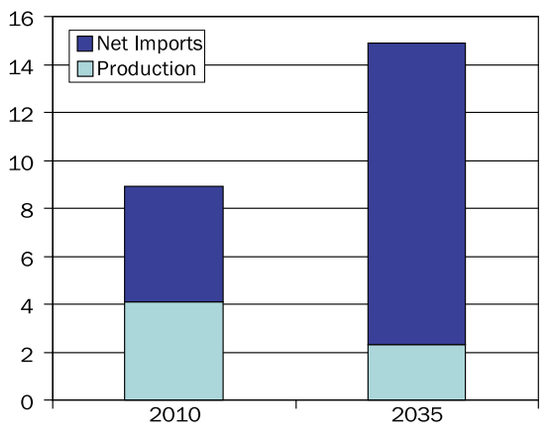
Source: Author's calculations based on BP (2011).

Figure 7 shows the share of conventional oil reserves in the major regions (light blue columns)[3] and the share of the same regions in world oil production. This comparison shows that regions with smaller reserves use them up through much higher production than regions with larger reserves. As a consequence, the concentration of the remaining world reserves increases in favour of the Middle East and Latin America (most of all, OPEC member Venezuela) with each passing year.[4] This strengthens OPEC's position and political power and its core region in the Middle East and North Africa (MENA). OPEC's share in world production will grow from 42 per cent in 2010 to over 50 per cent in 2035. The largest share of the increase will come from Iraq (IEA 2011: 41, 124).

The calculability of the global oil supply will be diminished by the political instability of the most important exporting countries, and also because 85 per cent of global reserves are under the control of state monopolies (such as Saudi Aramco). These companies do not follow the rules of a competitive market. As the most important contributor to national budgets and endowed with the most important foreign policy instrument of their country – influence over the global oil supply – they pursue a political agenda. The most important indicator of a functioning competitive market is that the price of a product is close to its marginal production costs. Since 2003, the oil price has totally lost contact with its marginal production costs, which in the Middle East are below USD10, while in a high cost country such as Russia they are below USD40. The average oil price (Brent) between 2003 and 2010 was USD67, with a strongly rising tendency (BP 2011: 15).

Furthermore, demand for oil is growing dramatically in a number of large emerging economies. Independent analyses, such as that of the IEA, assume that the number of automobiles in China and India will grow more than tenfold between 2007 and 2030 (IEA 2009: 83).

Figure 8: China's oil production, consumption and imports, 2010–2035 (million barrels per day)



Source: Author's calculation based on IEA (2011), pp. 107, 126.

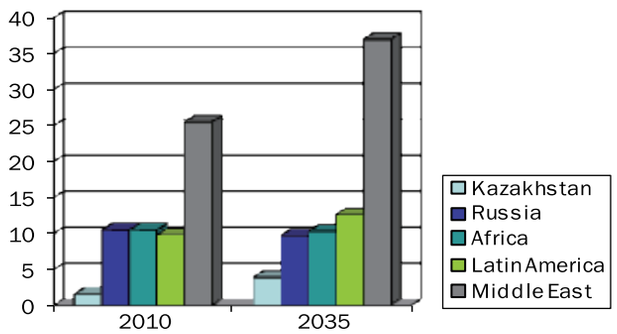
The IEA assumes that import demand for oil in China will grow by 2.6 times by 2035. This is more than consumption growth due to the expected decline of domestic oil production. We should be aware that the assumed increase in consumption of only 67 per cent is a very moderate assumption. It is hardly compatible with the increase in the transport sector and the ongoing share of oil in fuel consumption in that sector (above 90 per cent)[5] or with an estimated efficiency improvement of roughly 25 per cent. It would be no surprise China's oil consumption increased significantly more than by 67 per cent by 2035. But even in terms of the IEA figures of the new policy scenario the increase in China's import demand (7.8 million barrels per day, mbd) and India (4.4 mbd) – given similar demand increases in other emerging economies – cannot be compensated by demand reductions in industrialised countries.

[3] Figure 7 shows conventional oil reserves. The inclusion of so-called unconventional reserves – oil sands, but also coal to liquid and others – would give a slightly different picture. Unconventional oil production has the major disadvantage of high environmental damage, including extremely high greenhouse gas emissions per energy unit. Therefore, the IEA expects a share of unconventional oil in total oil production of below 10 per cent even in 2035.

[4] »The necessary capacity additions will come largely from fields already discovered but yet to be developed, mainly in OPEC countries« (IEA 2011: 123).

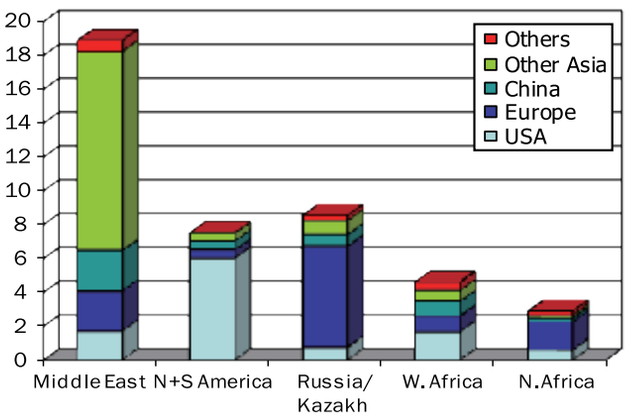
[5] That is, a 92 per cent share in total fuel consumption in the transport sector for oil in 2035 in comparison to 95 per cent in 2010 (IEA 2011: 592).

Figure 9: Oil production in exporting regions (million barrels per day)



Source: Author's calculation based on IEA (2011), pp. 126–34.

Figure 10: Inter-area oil trade, 2010 (million barrels per day)



Note: Exporting regions = columns; importing regions = colours.
Source: Author's calculations based on BP (2011), p. 18.

The very fact that oil is linked mainly to the transport sector creates a problem in itself: 94 per cent of global transportation is oil driven (2009). According to the estimates of the International Energy Agency this virtual monopoly of oil as transportation fuel will be reduced only marginally to 88 per cent by 2035 (IEA 2011: 544). This monopoly creates a specific sensitivity. No economy in the world, be it industrialised or an underdeveloped one, can function without a transportation sector. Therefore, elasticity of demand is particularly low: in other words, a drastic price rise induces only a small demand reduction, but a small demand rise can induce a dramatic price rise. This puts a very powerful instrument in the hands of oil producing countries. They can easily generate further price rises by small supply reductions.

Unlike China, Europe will not increase its oil demand during the decades to come. However, like China domestic production will decline and thus Europe needs a stable, even slightly growing supply from outside Europe. Traditional suppliers like Russia and North Africa will, however, not increase their production (Figure 10), but want to deliver a growing share of their export potential to Asia.

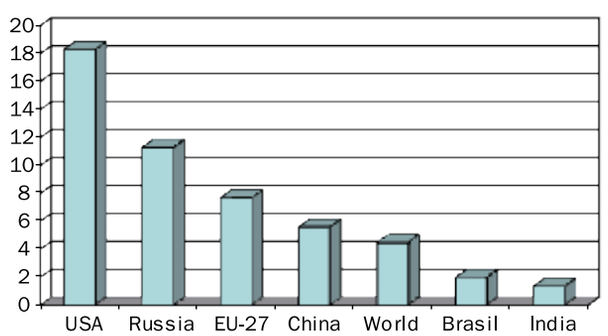
The trend of shifting the global oil supply towards OPEC countries and demand towards the Asian emerging economies will further reduce the chances of a market developing based on transparency and fair competition. At the same time, China's understandable interest in obtaining further access to producer countries which have not yet provided China with oil will reduce the chances of conflict solutions in Africa and the Middle East because of its different approach to bilateral relations. A major concern for Western countries is the shift of power in the Middle East in favour of Iran, since China has a strong interest in acquiring better and even exclusive access to Iran as one – besides Russia and Saudi Arabia – of the three major energy reserve countries. China as a veto-wielding member of the UN Security Council can do a lot to help Iran become a dominant regional power if Iran, geographically favourably situated with regard to a potential pipeline infrastructure, treats China as a preferential energy partner.

5. The Impact of Climate Policy on the Energy Mix

The International Energy Agency's World Energy Outlook, published on 9 November 2011, launched a dramatic appeal to the world public to agree on changes in the global energy structure. Since investments such as power stations have to be used over decades »four fifth of total energy-related CO_2 emissions permissible by 2035 in the 450 scenario are already ›locked-in‹ by our existing capital stock« (IEA 2011: 40). The deadline laid down for fundamental change is 2017: after this, no further CO_2 emitting investment should be made.

Why is the world community unable to agree on a path that leads to the goal agreed on as early as 1992 during the Rio Conference, when it is well aware of the situation and has committed itself to this goal several times in the meantime? The problem is locked in by the double asymmetry of emissions distribution. One asymmetry is that emerging economies and developing countries emit much less per capita than industrialised countries (Figure 11). On this basis, the emerging economies and developing countries reject any absolute limitation of their emissions as long as their per capita emissions are below those of the industrialised countries. China is the most prominent representative of this group.

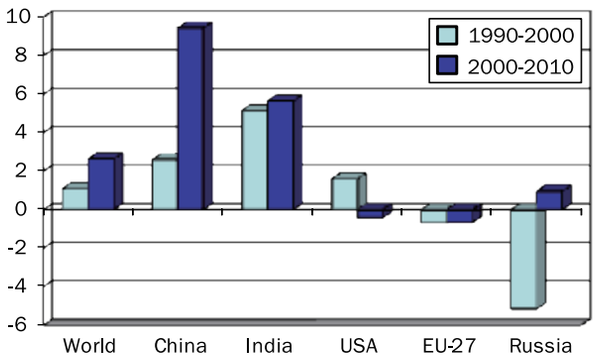
Figure 11: CO_2 emissions, 2010 (tonnes per capita)



Source: Author's calculation based on Ziesing (2011): 70; Population Statistics.

The other asymmetry is that since 2000 all global CO_2 emission growth has been generated by emerging economies and developing countries (Figure 12).

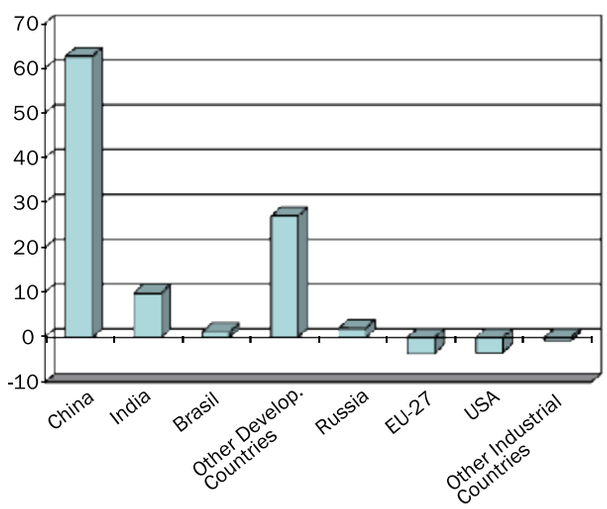
Figure 12: Growth of CO_2 emissions (annual average; %)



Source: Author's calculation based on Ziesing (2011): 70.

China has had a huge share of global emissions growth since 2000 (Figure 13). Therefore, the industrialised countries argue that without a strong commitment on the part of China – but also India – to restrict its emissions there is no chance of solving global problems, whatever the industrialised countries do.

Figure 13: Shares of countries and country groups in global CO_2 emissions growth, 2000–2010 (%)

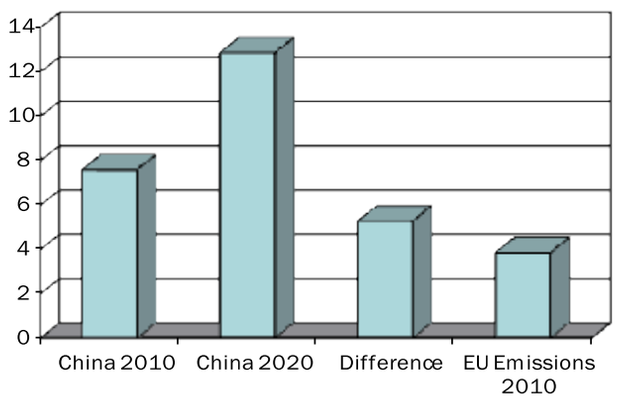


Source: Author's calculation based on Ziesing (2011): 70.

China, however, has committed itself only to reducing its energy intensity. If China met its commitment made in Copenhagen (»Copenhagen pledge«) to reduce its energy intensity by 40 to 45 per cent between 2005 and 2020, and if average annual GDP growth between 2010 and 2020 was 8 per cent (about 2 per cent less than during the previous decade) this

would lead to CO_2 emissions growth of more than 5 billion tonnes in 2020 in comparison to 2010. The absolute emissions of the EU in 2010 were 3.86 billion tonnes (Figure 14). This means that even if the EU reduced its emissions to zero it could not prevent an increase of global emissions (if others remain unchanged). Without a strong commitment on the part of China no solution is possible.

Figure 14: China's emissions potential (billion tonnes)



Notes: China's CO_2 emissions in 2010 und planned emissions (2020) according to the Copenhagen pledge at 8 per cent annual GDP growth. EU27 total CO_2 emissions in 2010.

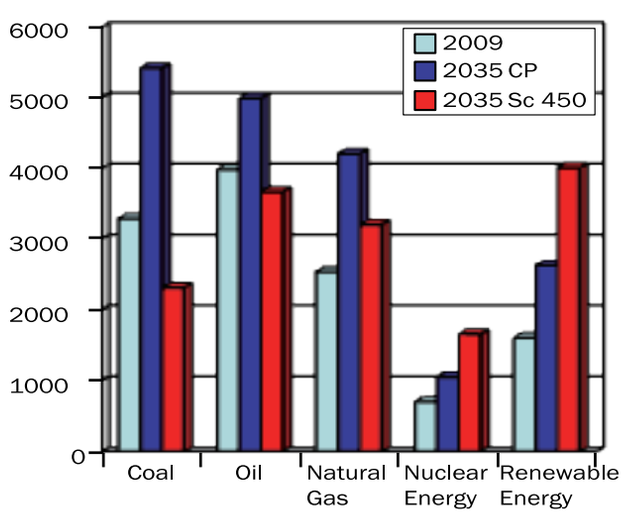
Source: Author's calculations based on Ziesing (2011), p. 70.

The double asymmetry reflects a major burden-sharing problem. Negotiations between emerging economies and developing countries and industrialised countries must aim at reducing the current obstruction caused by the double asymmetry. However, the mandate of the negotiation teams at the annual talks under UN auspices gives no room for this. The industrialised countries – at least the EU – even after many unsuccessful negotiation rounds, believe that an offer of a significant emissions reduction (for instance, a 30 per cent reduction by the EU between 1990 and 2020) would encourage the emerging economies and developing countries to offer an emissions restriction of their own. This, however, fails to take into account the first asymmetry, which the emerging economies and developing countries insist must be balanced first.[6]

Nicholas Stern, former chief economist of the World Bank, in his famous report (familiarly known as the Stern Review) makes the assertion – which is basically not disputed by economists – that failure to comply with the Climate Convention target will cost the world community at least four times as much as compliance (Stern 2006). If this is so, why does the market not reward a cost-efficient solution of the problem? The answer must be that the costs of a failure to find a solution are not being attributed according to the »polluter pays« principle. For instance, the consumers of electricity do not pay for the costs generated by the pollution caused by power stations. Government, therefore, is responsible for providing a framework that internalises the costs of emissions, in other words, putting the burden of the costs caused by emissions on the consumers of fossil energy. Only then will the market send the correct signals to encourage a least-cost solution.

How far we are under current conditions from meeting climate objectives is shown by Figure 15:

Figure 15: Global energy mix, 2009–2035 (IEA: Current Policy und Scenario 450 (mtoe))

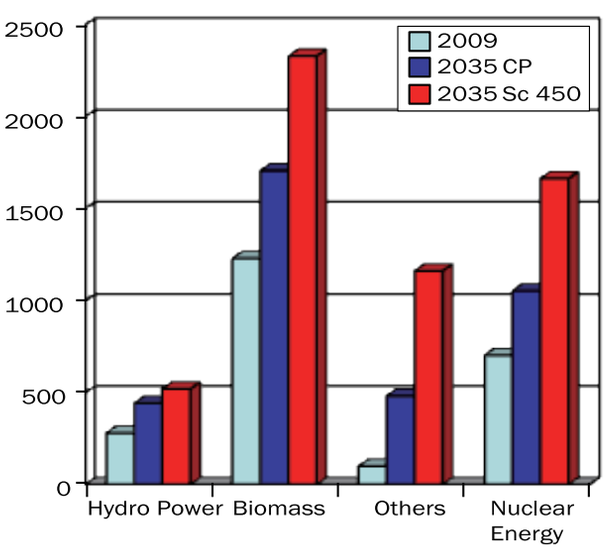


Source: Author's calculation based on IEA (2011), pp. 544–545.

6 »India has unilaterally declared that its per capita greenhouse gas emissions will not be permitted to exceed those of industrialized countries.« Source quoting the Foreign Ministry of India (Engelmeier and Roth 2010).

Figure 15 shows the share of each of the energy carriers in the global energy mix. The light blue columns present the real 2009 share, the dark blue columns the 2035 share under conditions of the current policy and the red columns reflect a normative constellation which exemplifies the energy mix in 2035 if the 2^0 Celsius objective is to be achieved. The differences between the dark blue and the red columns indicate the problem we have to deal with. Currently, we are on a path which will see coal surpass oil as number one energy carrier, whereas coal should be placed fourth, behind oil, natural gas and renewables. Global oil consumption should decrease, not rise. Finally renewables should be the number one energy carrier instead of number four.

Figure 16: Renewables and nuclear energy, 2009–2035 (IEA: Current Policy und Scenario 450 (mtoe))



Source: Author's calculations based on IEA (2011), pp. 544–545.

Figure 16 shows that biomass has the largest share among non-fossil energy (more than nuclear energy, for example). This position will be stable not only under the current policy scenario but also in the case of Scenario 450. The largest growth, however, must come from the »others«, including solar power and wind energy, geothermal energy and tidal power.

6. Approach To a Solution

There are basically two reasons for a fundamental change in the global energy structure. First, the need to mitigate the extremely risky situation regarding the future oil supply, and second, the commitment by the international community to restrict climate change to a manageable extent. Both objectives can be achieved by joint measures. Nicholas Stern's assertion that the solution will be much cheaper than failure to reach a cient resources for investment. However, the burden-sharing problem is tricky because of the double asymmetry described above.

There is a strategy that could overcome this problem based on two principles neither of which contradict the thinking of the emerging economies and developing countries or the industrialised countries. The first is the »polluter pays principle«: the costs of any damage should be paid by those who caused it. This principle is a precondition for a functioning market economy. The externalisation of such costs distorts the signals given by the market pretending: for instance, the impression is given that electricity can be produced in coal power stations at relatively low cost. The second principle picks up the claim made for the past two decades by important players, especially India and China. It says that all human beings have the same right to emit greenhouse gases (the »per capita principle«). It is often argued that this is a principle of justice. The representatives of the industrialised countries must realise that any principle based on unequal rights with regard to emissions will never be acceptable to the majority of emerging and developing countries. This is the clear message of over 20 years of international negotiations. The sooner experts and decision-makers in the industrialised countries realise this the better for the negotiation process.[7] Any approach that neglects this principle and focuses on relative power will necessarily fail.

If both principles are accepted the design of a road map leading to a solution starts to become clear (Leimbach and Müller 2008). The first principle is

[7] The German Advisory Council on Global Change (WBGU) argues in a similar way, referring also to a vision formulated jointly by Chancellor Angela Merkel and Prime Minister of India Singh (WBGU 2009: 8, 22).

taken into account by introducing a global cap on emissions for each year, decreasing from 2020 on or earlier, so that the 450 ppm objective can be achieved. It means that carbon emissions need a price which is high enough that total emissions require a certificate. Principally, there are two ways to establish the price of a certificate. One is to impose a (national) tax that should be equally high in all countries in order to prevent competitive disadvantages (such a disadvantage currently exists with the European ETS). The other is equal emission rights per capita. Emission certificates would be bought from a global institution that also controls their trade. The advantage of the latter option is that the quantity of emissions is fixed by the number of certificates – in contrast, a tax rate cannot take into account how many certificates will be required under this price constraint – and the whole process is budget neutral. The European Union started an emission trading system (ETS) in 2005 and will extend it from 2013 onwards having experience with every component of such a system. Its basic elements are: fixing an emissions total and dividing it into units of tonnes: each tonne of emissions would need a certificate. Since the total number of certificates would be limited, if traded in free competition they would acquire a market price. The smaller the supply of certificates, the higher the price. Unfortunately, this creates a competitive disadvantage since economies that do not participate in an emissions trading system offer emissions at no charge. This is a complaint made by companies in the EU whose production involves high energy intensity and why they are threatening to move with their production to countries that do not impose a charge on greenhouse gas emissions.

A global ETS requires an organisation which manages the whole process, an Emission Trading Agency (ETA) that would carry out two tasks in particular. The first would be to build up a monitoring system that carefully monitors emissions in all countries. The Kyoto Protocol has already established a basic system for monitoring CO_2 emissions. Second, it has to sell the certificates and distribute the revenue on a per capita basis. However, the ETA would have to guarantee and verify that a net inflow would be used exclusively to modernise the energy sector. Only countries that accept international monitoring and the rules of income distribution would qualify to participate. All countries that could expect a net inflow due to their per capita emissions below the global average would be interested in participating, but not every one would have to be involved from the beginning.

During a first period of approximately ten years it would be sufficient if the major emitters were part of the system, in other words, China, India, the EU, the United States and Russia. But even if the United States is not part of the system from the beginning, the process could commence. Even without being a member of the Kyoto system since 2000, the United States is reducing its greenhouse gas emissions and will maintain a declining trajectory. To that extent, US participation – rather than non-participation – would not have a huge impact on global emissions development and the need to peak before 2020. The participation of Russia is also dispensable for the time being because its contribution to global emissions is just 5 per cent, with a declining trend.

The second principle (equal emission rights per capita) provides the key to the distribution of ETA income. It is obvious that there will be a net flow from industrialised countries with high emissions per capita to emerging economies and developing countries with low emissions per capita. This should not be a reason to reject the system on the side of the industrialised countries, for at least three reasons. First, the Copenhagen consensus implies a basic agreement on their part to provide 100 billion dollars per year from 2020 onwards for modernisation, mainly of the energy sector in emerging economies and developing countries. If the net flow in the global ETS does not exceed 100 billion dollars per year, therefore, it would not impose an extra financial burden on the industrialised countries. It might therefore make sense to include a cap on the net flow in this order of magnitude, at least for the period between 2020 and 2030. Second, one of the effects of the system would be a reduction in global demand for oil and thus would reduce the oil price significantly. An oil price decline of this kind occurred after the financial crisis of 2008, after the Asian crisis in 1998 but also

during the first half of the 1980s. The net flow from the industrialised countries would therefore not just be increased but also to a large extent diverted. The EU, for instance, in 2010 paid (average Brent oil price 79.5 dollars) 78 billion dollars more for their oil imports from outside the EU than in 2009 (average Brent oil price 61.7 dollars) (BP 2011: 8–15). The other industrialised countries – and also China – had an analogous burden to carry and this not for the first time in the decade after 2000. If the EU economy is flexible enough to absorb an oil price rise of close to 80 billion dollars from one year to the other it should be flexible enough to substitute an oil price increase by a net flow to emerging economies and developing countries to buy emission certificates.

The third reason why the industrialised countries should agree is that this net flow is key to the solution of both problems: the limitation of the greenhouse gas concentration in the atmosphere, according to the common pledge, and the mitigation of the rise in demand for oil, with all its conflict-promoting components. According to Nicholas Stern, as we have seen, this solution will save a huge amount of money if we can prevent the damage that could result from major climate change. China and India would not only benefit from the solution of these two problems but also gain from the net inflow that the global ETS would provide, being able to modernise their energy systems. Even though China today has higher per capita emissions than the world average, the potential to reduce those emissions is enormous since its energy intensity – energy consumption per unit of GDP – is several times higher than that of the EU countries.

China, more than any other country including the United States, is in a position to clear the way for a global solution to both problems. First, by preventing a widening gap between global oil demand and supply and second, by adjusting the world community to the objective of preventing »dangerous anthropogenic interference with the climate system« (United Nations 1992). If China sticks to its Copenhagen strategy of pledging energy efficiency improvements in the order of 2.5 per cent per year, emissions growth, given annual economic growth of 8 to 10 per cent, will be so high that no emissions reduction on the part of the industrialised world could compensate for it. If China signalled its agreement to a global solution on the basis of the two principles (polluter pays and equal emission rights per capita) other major players would follow and this approach could be brought on track. If the United States and Russia do not join the system from the beginning they would isolate themselves and probably would have second thoughts later on. It is obvious that a price on carbon emissions within an emissions trading system would lead to a reduction of global oil demand and thus also to a relative reduction of the oil price. For China, it would be a win–win situation, while the industrialised countries would have to experience a net flow from North to South due to their initially high per capita emissions. There is no doubt, however, that the benefits would far outweigh the costs, even for the developed countries.

BIBLIOGRAPHY

BP (2011), *Statistical Review of World Energy*, London, June 2011.

Engelmeier, Tobias and Roth, Isabelle-Jasmin (2010), *After Copenhagen and before Cancun*, Friedrich Ebert Stiftung, Berlin November 2010.

International Energy Agency (IEA) (2011), *World Energy Outlook 2011*, Paris November 2011.

International Energy Agency (IEA) (2009), *World Energy Outlook 2009*, Paris.

Leimbach, Berthold and Müller, Friedemann (2008), *European Energy Policy: Balancing national interests* and the need for policy change, Friedrich Ebert Stiftung, Climate Energy Papers 1/2008.

Stern, Nicholas (2006), *Stern-Review on the economics of climate change*, HM Treasury, London.

United Nations (1992), *United Nations Framework Convention on Climate Change 1992*, article 2.

WBGU (2009), *Kassensturz für den Weltklimavertrag – Der Budgetansatz*, Berlin.

Ziesing, Hans-Joachim (2011), *Der erwartete Rückschlag für den Klimaschutz: weltweite CO_2-Emissionen 2010 kräftig gestiegen*, Energiewirtschaftliche Tagesfragen No. 9/2011, pp. 67-68.

OTHER BRIEFING PAPERS

No. 1
The G-20: A New Global Governance Framework for Sustainable Development?
Thomas Fues, Friedrich-Ebert-Stiftung Shanghai, 2010

No. 2
Global Union Federations and the Challenges of Globalisation
Torsten Mueller, Hans-Wolfgang Platzer and Stefan Rueb, Friedrich-Ebert-Stiftung Shanghai, 2010

No. 3
Singapore: A Depoliticized Civil Society in a Dominant-Party System?
Kenneth Paul Tan, Friedrich-Ebert-Stiftung Shanghai, 2010

No. 4
Housing Policy in Germany - A Best Practice Model?
Bjoern Egner, Friedrich-Ebert-Stiftung Shanghai, 2011

No. 5
The Historical Evolution of China's Administrative Compensation System and its Recent Amendments
YANG Yin, Friedrich-Ebert-Stiftung Shanghai, 2011

No. 6
The End of Export-led Growth: Implications for Emerging Markets and the Global Economy
Thomas I. Palley, Friedrich-Ebert-Stiftung Shanghai, 2011

No. 7
Political Parties, Membership Mobilisation and Power Management - The Example of the Federal Republic of Germany
Gerd Mielke, Friedrich-Ebert-Stiftung Shanghai, 2011

No. 8
The End of Nuclear Power? Time to Rethink International Energy Policy
Nina Netzer, Friedrich-Ebert-Stiftung Shanghai, 2011 (Chinese version published in Shanghai; the original English version is published by FES Berlin as part of the "Dialogue on Globalization" series)

No. 9
The Earnings Penalty for Motherhood in Urban China during the Economic Transition
Jia Nan and Dong Xiao-yuan, Friedrich-Ebert-Stiftung Shanghai, 2011

No. 10
Europe's Emissions Trading System: An Effective and Efficient Instrument for a Low-Carbon Economy
Hans-Joachim Ziesing, Friedrich-Ebert-Stiftung Shanghai, 2011

No. 11
At a Snail's Pace: From Female Suffrage to a Policy of Equality in Germany
Beatrix Bouvier, Friedrich-Ebert-Stiftung Shanghai, 2011

No. 12
Gender Budgeting — An Equality Policy Strategy
Elisabeth Klatzer and Barbara Stiegler, Friedrich-Ebert-Stiftung Shanghai, 2011

Briefing Paper Special Issue
Protection for Domestic Workers - Challenges And Prospects
Friedrich-Ebert-Stiftung Shanghai, May 2011

Briefing Paper Special Issue
Think Tanks in Policy Making - Do They Matter?
Friedrich-Ebert-Stiftung Shanghai, September 2011

OTHER FES-PUBLICATIONS

China, the EU and Latin America: Current Issues and Future Cooperation
Birte Klemm and Niu Haibin (eds.), Shanghai: Shanghai People's Publishing House, 2011

Altenpflege und Pflegeversicherung. Modelle und Beispiele aus China, Deutschland und Japan
Susanne Langsdorf, Rudolf Traub-Merz and Chun Ding (eds.), Shanghai: Shanghai Academy of Social Science Press, 2010

Comparative Industrial Relations: China, South-Korea and Germany/Europe
Rudolf Traub-Merz and Junhua Zhang (eds.), Beijing: China Social Science Press, 2010

Public Participation in Local Decision-Making: China and Germany
Ping Liu and Rudolf Traub-Merz (eds.), Shanghai: Shanghai Academy of Social Science Press, 2009

China-Europe-Africa Cooperation: Chances and Challenges.
Proceedings of the Sixth Shanghai Workshop on Global Governance.
Yan Yu (ed.), Shanghai: FES and Shanghai Institutes for International Studies, 2008

Current Situation and Future Prospects of Asia-Europe Security Cooperation.
Proceedings of the Fifth Shanghai Workshop on Global Governance.
Katharina Hofmann, Katja Meyer and Yan Yu (eds.), Shanghai: FES and Shanghai Institutes for International Studies, 2007

About Friedrich-Ebert-Stiftung

The Friedrich-Ebert-Stiftung (FES) is a private cultural non-profit institution committed to the ideas and basic values of social democracy. It was founded in 1925 and aims to further the political and social education of individuals in the spirit of democracy and pluralism. Its international cooperation connects the Friedrich-Ebert-Stiftung with partners in more than 100 countries all over the world. The international cooperation of the FES strives for facilitating participation, pluralism, rule of law, social justice and non-violent conflict resolution in different societies.

Learn more about FES: www.fes.de
Learn more about FES in China: www.fes-china.org

Contact

Friedrich-Ebert-Stiftung (Beijing), Ta Yuan Diplomatic Compound, Building 5, Entrance 1, 12th Floor, Office 5-1-121, Xin Dong Lu 1/Chao Yang Qu, 100600 Beijing, VR China

Friedrich-Ebert-Stiftung (Shanghai), 7A Da An Plaza East Tower, 829 Yan An Zhong Lu, Shanghai 200040, VR China

Briefing Paper
To subscribe the Briefing Papers send an e-mail to:
subscribe@fes-shanghai.org
To unsubscribe send an e-mail to:
unsubscribe@fes-shanghai.org

Imprint: Major Turning Points of International Energy Policy: China's Key Role. Shanghai: FES-Shanghai Office, 2012.
Responsible: Catrina Schläger, Resident Director, FES Shanghai Coordination Office for International Cooperation