Chapter 2

The Security Implications of Climate, Energy, and Food Issues

In recent years, climate change, energy supply, and food supply have become high-profile concerns in the context of security. During the G8 Hokkaido Toyako Summit hosted by Japan in July 2008, these issues occupied much of the discussion in the meetings between the G8 leaders and between the heads of major economies. The summit ended with a pledge by the major economies to tackle not only climate change, but also the energy and food challenges intertwined with that change.

The skyrocketing of energy and food prices in the early half of 2008 sent shock waves throughout the world's economies, reaching into the corners of everyday life. The price surge was partly the result of financial maneuvering by speculators, namely, a flood of investment in oil and food futures. Although the global financial crisis that erupted in the following autumn had a dampening effect on price escalation, there still remain structural factors that could inflate prices again over the coming years. In the case of energy, supply will likely become extremely tight over the long run due to soaring demand, particularly from the rapid economic growth of emerging powers like China and India. If these market predictions are realistic, energy prices may rise again. At the same time, there are factors that threaten to tighten food supply and demand for a long time, such as the harmful impact of unseasonable weather on crop yields in major food-exporting nations, and the diversion of corn and soybean supplies as materials for biofuel production. The unseasonable weather and other abnormal climatic patterns are viewed by some experts as the product of global warming caused by the large-scale emissions of greenhouse gases through the use of fossil fuels. Moreover, the increasing demand for biofuels is being driven by a growing preference for energy sources with a low environmental impact and by higher expectations of biofuels as an alternative energy source or means of improving energy self-sufficiency amid soaring energy prices.

As these examples indicate, climate change, energy supply, and food supply are closely interwoven issues, and hence can be resolved only through an integrated approach by the international community. This endeavor will likely begin with a thorough examination of the discussion that has taken place to date regarding climate change as a security issue, and of the price and supply trends that are forecast for food and oil—currently the predominant energy source—as well as the factors that will shape those trends.

1. Climate Change and Security

(1) Discussion in the International Community concerning Climate Change and Security

In recent years, it has been strongly argued that climate change and other phenomena caused by global warming should be viewed as a security problem. Most of these discussions are based on the issues raised by the *Stern Review on the Economics of Climate Change*, released by the British government in October 2006, and the findings of the *Fourth Assessment Report* (AR4) issued in installments by the Intergovernmental Panel on Climate Change (IPCC) from February to November 2007.

The *Stern Review*, implemented in July 2005 by British Prime Minister Tony Blair and Chancellor of the Exchequer Gordon Brown, is an investigative report focused on the economic aspects of the climate change issue. The report stresses the need to respond to the problem of climate change to sustain economic growth, stating that a failure to do so will result in the obstruction of economic growth and pose the risk of large-scale disruption to economic and social activities. Although tackling this issue will entail high costs, it argues that early action can bring economic benefits that outweigh these costs. The report states that all countries will have to take cooperative action based on an international framework. As examples of concrete measures to realize a low-carbon society, it proposes the mitigation of emissions through carbon emission costing, promotion of the development of innovative low-carbon technologies, and the creation of incentives to encourage people to voluntarily reduce emissions. It also points out that, since the impact of climate change will be more serious in developing countries, it will be necessary to provide international support for them.

The distinctive character of the *Stern Review* lies in its economic approach to the investigation of measures to solve the global problem of climate change, taking into account the risks and uncertainties involved. On this basis, it concludes that it is important to develop the various measures based on multilateral cooperation through the formulation of appropriate economic incentives and an international framework. In recognizing that climate change poses serious risks that could trigger violent international disputes through its impact on economic and social behavior, the Stern Review can be said to have provided the stimulus for the current debate on "climate security." However, in the sense that it views the

global environment as international public goods and calls for international cooperation to design systems and share costs, it is very much a public policy proposal and does not always elucidate clearly the relationship between climate change and security.

The AR4, on the other hand, leaves no room for doubt about the warming of the climate system, stating with medium confidence (about a 50 percent chance) that the impact of climate change is already becoming evident in the natural and human environment. The AR4 predicts that, if greenhouse gases continue to be emitted at the current pace or faster, the climate system will change significantly in the 21st century and that extreme climate phenomena and increasing sea levels will have adverse effects on natural and human systems. By building on the findings of the *Third Assessment Report* (AR3) issued in 2001 and providing a more detailed and comprehensive view of the climate change that had already been discussed, the AR4 stimulated further discussion of its basis, effects, and adaptation and mitigation measures. Moreover, the AR4 is thought to have had a greater influence on policymakers, officials, and researchers in various countries because the IPCC was awarded the Nobel Peace Prize together with former US Vice President Al Gore in October 2007 and the role of the IPCC was alluded to in the reports of both the 13th Conference of the Parties (COP13) to the United Nations Framework Convention on Climate Change (UNFCCC) and the 3rd Conference of the Parties serving as the Meeting of Parties to the Kyoto Protocol (COP/MOP3), held in Bali, Indonesia, the following December.

Compared to the AR3, the AR4 takes more account of projected social and economic changes in its analysis of the impact of climate change. As a result, it argues that the level of vulnerability varies greatly according to the scenario and is strongly determined by the factors of population, income level, and technological development. For example, a much higher population in the future is expected to be exposed to risks such as food problems, flooding, and water shortages resulting from climate change in the scenarios where individual income is low and the population growth rate is high compared to other scenarios. This means that differences in the impact of climate change on people's lives will be determined more by differences in the adaptability of a region than by the extent of climate change itself. Furthermore, when a vulnerable region is exposed to stresses other than climate change, such as AIDS/HIV, poverty, social disparity, and ethnic disputes, its ability to adapt may become worse. Thus the impact of climate change

is not only a direct risk but may also amplify the risks indirectly by increasing a region's vulnerability. In this respect, the AR4 can be said to have made a more penetrating assessment of the relationship between climate change and security.

Now let us examine the discussion of climate change in the main international regimes in recent years. At the G8 Summits, climate change was first raised as a major issue at the Gleneagles Summit held in the United Kingdom in July 2005. The participants agreed upon the Gleneagles Plan of Action and issued a document titled "Climate Change, Clean Energy and Sustainable Development." This document pointed out that climate change, energy supply and demand, and international development are mutually interrelated and that climate change may have a great impact in certain regions. It concluded that each country must discuss adaptation measures based on awareness of these issues.

Climate change was also raised as one of the issues on the agenda at the St. Petersburg Summit in Russia (July 2006) and the Heiligendamm Summit in Germany (June 2007). At the G8 Hokkaido Toyako Summit held in Japan in July 2008 it was discussed as a major issue at the summit meetings and the Major Economies Meeting (MEM). At this Summit, both the G8 Hokkaido Toyako Summit Leaders Declaration and the Declaration of Leaders Meeting of Major Economies on Energy Security and Climate Change were announced. In the latter declaration, the leaders of major economies stated that they would "commit to combat climate change…and confront the interlinked challenges of sustainable development, including energy and food security, and human health." In addition, the G8 Leaders Statement on Global Food Security, which was adopted independently from the summit meetings, pledged to "support country-led strategies in adapting to the impact of climate change, combating desertification." In relation to energy prices, it pledged to "ensure the compatibility of policies for the sustainable production and use of biofuels with food security" and accelerate the development of sustainable biofuels from non-food plant materials. This reflects the fear that the expansion of the use of biofuels, which are essentially an adaptation measure in response to climate change and ought to contribute to energy security, might have an adverse impact on food security by causing a rise in prices of primary product through speculative price inflation and political responses in the international community. Accordingly, the discussions at the G8 Hokkaido Toyako Summit reached the understanding that climate change is multiply linked in various ways to problems such as energy security and food

security and may therefore have an impact on the security environment.

Discussions in the United Nations (UN) have also come to stress that climate change should be approached as a security problem. At the 61st Session of the UN General Assembly held in September 2006, Margaret Beckett, the British Secretary of State for Foreign and Commonwealth Affairs, emphasized the importance of the role of the UN in dealing with the issue of climate change. She stated that climate security was at the heart of the United Kingdom's foreign policy alongside poverty reduction in Africa, and called upon the international community to respond rapidly to this problem. At the 62nd Session of the UN General Assembly held in September 2007, together with the usual security issues of the Darfur problem, the situation in Iraq and Afghanistan, and the Middle East peace process, a high level meeting was held before the General Debate to discuss the climate change issue. And at the 63rd Session of the UN General Assembly held in September 2008, the food crisis and climate change were part of the agenda at a dinner hosted by UN Secretary-General Ban Ki-moon.

At the UN Security Council (UNSC) meeting in April 2007, an open ministerial-level debate exploring the relationship between energy, security, and climate was convened upon the strong initiative of the United Kingdom, which then held the presidency of the UNSC. At the debate, the United Kingdom presented the concept paper "S/2007/186" on this theme. The paper stated that climate change has an impact on "potential drivers of conflict" such as border disputes, migration, resource shortages, and humanitarian crises, and that it was necessary for the UNSC to tackle this problem by adopting the concept of a "broad strategy of conflict prevention" indicated in UNSC Resolution 1625 (2005). UN Secretary General Ban Ki-moon expressed his support for Britain's perspective on this issue, which was also welcomed by most of the advanced countries. However, doubts were raised by representatives from emerging and developing countries. The Chinese representative argued that, since the UNSC did not have expertise on climate change and is a system of decision-making by a limited number of countries, it was not a suitable forum for discussion of problems requiring a broad international consensus. China therefore opposed the issuing of outcome documents and implementation of follow-up actions. The Pakistan representative, speaking on behalf of the "Group of 77" developing countries and China, stated that the UNSC's duty was to maintain international peace and security and that issues such as climate change should be assigned to the Economic and Social

Council and the General Assembly.

This difference in response reflects the large gap in attitudes toward reduction of greenhouse gas emissions between advanced countries in a period of stable growth and emerging and developing countries undergoing rapid economic growth. Apart from the United States, most advanced countries have ratified the Kyoto Protocol to the UNFCCC and have expressed misgivings regarding how the emerging and developing countries can be persuaded to commit to positive participation under a post-Kyoto Protocol framework. Advanced countries that view emissions trading in the private sector outside the Kyoto Protocol framework as a business opportunity are promoting the establishment of emissions trading schemes with the aim of taking the lead in the global market. However, while the emerging and developing countries recognize the need to reduce greenhouse gas emissions, they wish to avoid committing themselves within an international framework due to their fears that this will restrict the economic growth that guarantees the stability of their governments and to their psychological resistance to being included in a system led by advanced countries that have already emitted massive amounts of greenhouse gases. This has made them wary about discussions developing towards some kind of resolution in the UNSC concerning climate change caused by global warming.

International efforts to reduce greenhouse gas emissions, like the efforts in many international security issues, can only be more successfully and optimally realized when countries abandon their short-sighted national interests to some extent and cooperate by accepting an expected share of the burden. In reality, however, even when most countries or the interested actors agree in principle with the general argument, their interests are not always in accord in specific discussions, making it very difficult to determine policies for resolution through coordinated action.

(2) The Impact of Climate Change on Security

The IPCC-AR4 Working Group 2 has assessed the impact of climate change. In recent years, for example, over 2,000 people died as a result of heavy rains in India and Bangladesh in 2004, and in the United States Hurricane Katrina caused more than 1,700 deaths and immense damage in 2005. National armies were mobilized for disaster assistance, and since it is believed with high confidence (about an 8 in 10 chance) that global warming contributed to these unusual climate

phenomena, the argument that climate change is a security issue has come to be viewed as realistic.

Global warming is now expected to have a mostly adverse impact on human systems all over the world. A temperature rise of 2–3 degrees Celsius or more will have a detrimental effect on ecosystems and is also highly likely to have a negative economic impact throughout the world. It is predicted that, by the mid-21st century, water resources in mid-latitude and arid or tropical regions will decrease by 10–30 percent, worldwide food production will decrease if temperatures rise by more than 3 degrees Celsius, and millions of people will suffer from the impact of flooding and other climate-related damage by the 2080s.

In Asia, access to water resources and food is expected to be adversely affected as populations increase and living standards improve. In coastal regions, particularly mega-delta regions where populations are concentrated, the risks of water damage due to high tides or flooding are expected to increase. There are also fears of a higher incidence of diarrheal diseases and mortality rates resulting from flooding and other water damage, as well as increases in cholera bacteria and their virulence caused by rising coast sea water temperatures.

In response to the AR3, "clean-slate" investigations were conducted from an early stage in the United States through various reports on the impact of climate change on national security. After the publication of the AR3, one report that pointed out the importance of this issue and the need for a response by the military was *An Abrupt Climate Change Scenario and Its Implications for United States Security*, commissioned by Pentagon Defense Advisor Andrew Marshall and compiled and published by the consulting group Global Business Network in October 2003. This report studied the risks of international conflicts due to disrupted access to food, water, and energy resources resulting from global warming and subsequent rapid cooling that might stop oceanic circulation. However, the report only examined a scenario for dealing with unpredictable changes in the strategic environment and was not an analysis based on predictions with a high level of confidence.

To study the future impact on national security of the melting of Arctic sea-ice described in the AR3, the symposium "Naval Operations in an Ice-free Arctic" was held in April 2001 by the Office of Naval Research and the Naval Ice Center. A final report was drawn up and in July 2007 a follow-up symposium was held to discuss the non-military aspects of the problem. At this symposium, it was

recommended that new capabilities and systems such as GPS, fire control systems for snowstorm conditions, and acoustical sound databases would be needed for Arctic operations in the resulting new strategic arenas. At the political and strategic level, the US government has emphasized the importance of coordinating interests in territorial waters with Canada and other coastal nations and protecting the freedom of navigation, alliance relationships, and natural resources in the Arctic. To this end, it has proposed the appointment of a commanding officer to exercise unified control of the whole Arctic sea area. Since 2007, when the AR4 was published, the decrease of the summer sea-ice area has become more serious, accelerating international competition over underwater resources in the Arctic sea. In May 2008, a ministerial meeting of the five Arctic coast countries was held in Danish Greenland. The participants confirmed that they would resolve territorial waters issues based on discussions and international law, and cooperate regarding incidents such as accidents at sea and oil spills.

In response to the AR4, various reports were produced on the impact of climate change on the equipment and role of the military. The report *National Security and the Threat of Climate Change*, published by the US Center for Naval Analyses (CNA) in April 2007, assessed the direct impact of climate change on military systems, based on advice from 11 retired US officers, mainly from the navy. It pointed out, for example, that abnormal stress on systems or equipment caused by higher temperatures would result in considerable maintenance costs and that the shortening of hours workers could endure on deck would place restrictions on take-offs and landings on aircraft carriers. Regarding the challenges of military-related infrastructure, it pointed out that bases in low-lying regions such as Diego Garcia might be threatened by rising sea levels. In the North Atlantic, the greater frequency and strength of hurricanes might increase the need for carrier-based planes on carriers anchored on the East Coast to evacuate to land bases and these bases might suffer great damage. In fact, in 1992 Hurricane Andrew almost completely destroyed Homestead Air Force Base in Florida, and in 2004 Hurricane Ivan put Pensacola Naval Air Station out of operation for nearly one year.

In 2007, in an essay titled "Climate Change, Mass Migration and the Military Response" on the theme of environmental refugees in diplomatic policy journal *Orbis*, Paul Smith of the Naval War College discussed a military response to the problem of environmental refugees. Smith argues that immigrants would bring with them delicate racial and ethnic problems and, in the post-9/11 age, they could

also become a national security issue because they might be viewed as terrorists or their supporters. As appropriate military responses, he suggests border security, prevention of mass migration and suppression of disturbances, and participation in stabilizing operations to prevent migration. An example of military response to mass migration in the United States in recent years is the case of the tens of thousands of Haitians and Cubans who attempted to land on the Florida coast in boats and rafts from 1994. In response to this, the United States launched Operation Sea Signal by Joint Task Force 160 to provide them with temporary protection and transport them to the United States or return them to their homeland. More than 30 US Coast Guard patrol boats and US Navy vessels took part in this operation, rescuing about 14,000 Haitians at sea. About 8,000 military personnel have been involved in setting up and administering refugee camps for around 47,500 would-be immigrants.

In the European Union (EU), there is an increasing common awareness at the strategic level regarding the impact of climate change on security. In March 2008, a report titled *Climate Change and International Security* was presented to the European Council by the European Commission and the EU's High Representative for the Common Foreign and Security Policy. This report states that climate change caused by global warming might pose a serious security risk and that a response should be made as part of preventive security measures. It then outlines the likely impact of climate change in Europe and the international security environment and proposes responses. As possible threats, the report mentions the aggravation of conflicts over resources, the risks to coastal regions posed by rising sea levels, loss of territory and border disputes due to receding coastlines, environmentally-induced migration, political radicalization in weak or failing states, tension over energy supply, and the undermining of cooperative international relations. It points out the need for further studies to ensure that the European Security Strategy is more appropriate with respect to the impact of climate change. As responses, the report recommends enhancing the EU's own knowledge and capacities regarding climate change, the development of an international regime through a multilateral approach with the UN and the G8, and the strengthening of dialogue and cooperation with non-European countries, such as Africa and countries in the Middle East and Central Asia.

In Japan, the *Report on Climate Security* was published in May 2007 by the Sub-Committee on International Climate Change Strategy in the Global

Environment Committee of the Central Environment Council. This report argues that the concept of security has widened in scope in recent years to include the improvement of human security and wellbeing, and that climate change now affects not only national security but also other kinds of security, such as human security, food security, and energy security. It states that the notion of "comprehensive security" formerly used in Japan can contribute to the promotion of policies to respond to climate change on a global basis because this concept leads to the view that threats posed by climate change are threats to national livelihoods and human beings as a whole and that the promotion of international cooperation, including economic interdependence, will eventually improve security. Regarding the key concept of "climate security," in order to grasp the impact of climate change precisely and respond to it, the report expresses the hope that policies to respond to climate change will be promoted based on a clear political definition and shared recognition of this concept.

2. The Energy Problem and Security

(1) Oil Price Trends

On July 11, 2008, West Texas Intermediate (WTI) on the New York Mercantile Exchange (NYMEX), one of the major crude oil price indexes, posted its highest ever price of $147.27 a barrel. The price of oil had surged about 50 percent in just over half a year from the $100 a barrel level at the end of 2007. However, as demand for oil decreased with an economic downturn mainly in advanced countries, the oil price plunged back to around $100 a barrel in just two months by mid-September. This price decline was accelerated after the whole global economy was caught up in the financial crisis originating in the United States in September and oil demand decreased rapidly not only in advanced countries but in emerging countries too. On December 31, the WTI closing price was just $44.60 a barrel.

The energy situation in 2008 has thus been characterized by violent short-term fluctuations in oil prices, while it has again become clear that the current oil price reacts hypersensitively both to the current supply and demand situation and to forecasts concerning the medium- to long-term supply and demand trend. Since the market anticipated a medium- to long-term tightening of supply and demand, the oil price trended continuously upwards from 2003, as shown in Figure 2.1.

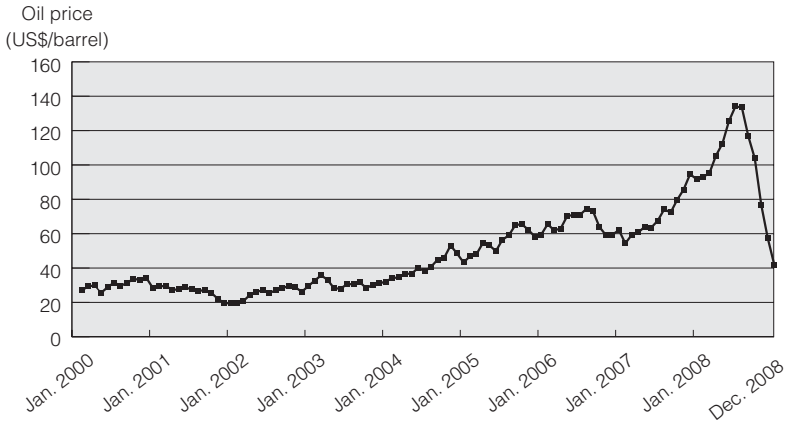
When current demand suddenly plunged from September and demand forecasts had to be revised downward with the economic downturn, the price dropped sharply in reaction.

The greatest cause of this upward trend in the oil price is that while energy demand from emerging countries, particularly China and India, was increasing, the production capacity of the oil-producing nations failed to grow and, as oil refining capacity remained low, a tightening of supply of demand was forecasted in the medium and long term.

Another factor behind the dramatic fluctuation in oil prices is thought to have been financial. In response to forecasts of a tightening of supply and demand, large amounts were invested in the oil futures market.

As a result of increased investment in commodity futures markets by pension funds and government funds through index funds run by investment banks and similar institutions, the size of the NYMEX has rapidly expanded since around 2003. With the financial uncertainty triggered by the subprime mortgage loan problem in the United States in the second half of 2007, these funds were redirected to safer assets. The strong possibility that tightening supply and demand in the oil market would continue in the medium and long term and the low likelihood that the price would reduce demand made the oil futures market

Figure 2.1. Oil price trends (Jan. 2000 – Dec. 2008)



Source: Compiled from EIA statistics.

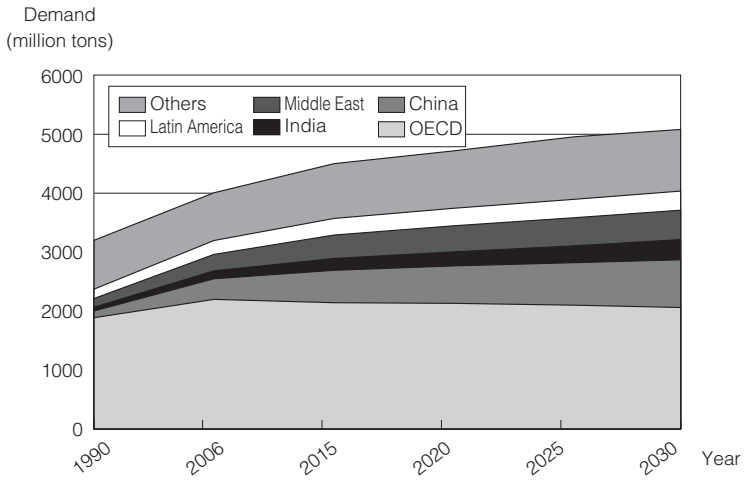
attractive to investors. Large amounts of funds are said to have flowed into this market, which is significantly smaller in scale than the stocks and bonds market, and the price of oil is thought to have soared from 2007 to 2008 as a result. On the other hand, among the factors leading to the economic downturn that contributed to the drop in oil prices were the sharp rise in consumer prices under the influence of soaring oil prices and the doubts about the future of the US economy caused by the financial uncertainty that had originally sparked investment in the oil futures market.

On November 12, 2008, the International Energy Agency (IEA), taking into account the impact of the stagnation of economic growth on energy demand, announced its world energy supply and demand forecast for the period up to 2030. Although it has revised its forecast downwards by 10 percent from the 2007 forecast, the IEA predicts that, assuming current government energy policies do not change, energy demand will increase by about 45 percent between 2006 and 2030. Moreover, increased energy demand in countries not members of the Organization for Economic Co-operation and Development (OECD) will account for 87 percent of this increase. In particular, rapid economic growth will continue in China and India, which will together account for more than 50 percent of the increase in world energy demand. Demand will also grow conspicuously in Middle Eastern countries, accounting for about 11 percent of the total increase.

The IEA predicts that, although the increase in world oil demand will be sluggish from 2008 to 2009, economic growth will accelerate again from 2010, leading to an average annual increase of 1 percent until 2030. This means that daily oil demand will grow from 86.2 million barrels in 2008 to 106 million barrels in 2030. This growth is also due to increased demand in non-OECD countries, whose oil consumption is expected to be almost equal to that of the OECD countries by 2015. It is predicted that demand in China, India, Middle Eastern countries, and Latin American countries will together account for about 90 percent of the increase in oil demand in non-OECD countries. Figure 2.2 shows the trends in world oil demand until 2030 by country or region.

Oil supply, on the other hand, is determined by the scale of production capacity. In order to catch up with the increase in medium- to long-term demand, it is necessary not only to make up for the decline in the amount produced from existing oil fields, but also to increase overall production capacity. This necessitates

Figure 2.2. Oil demand trends (actual/forecast)

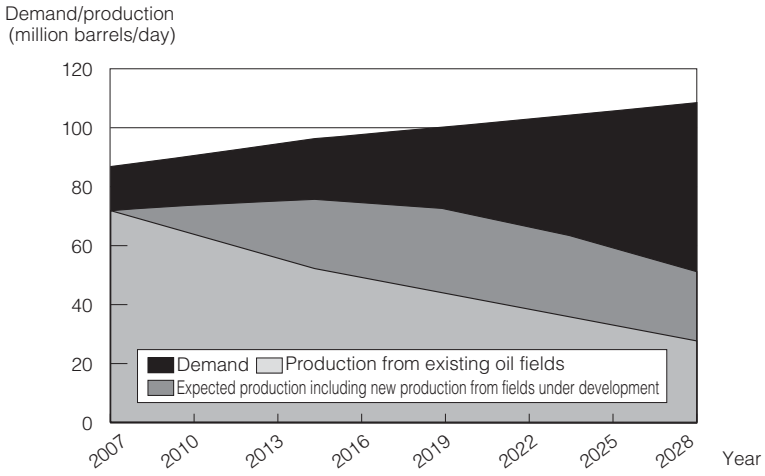


Source: Compiled from IEA, *World Energy Outlook* 2008.

new exploration and development, requiring prior investment. The IEA projects that worldwide new production capacity will have to be expanded by 3.5 million barrels a day every year. Thanks to past investments, the growth of production capacity will exceed the growth in demand up to 2010. From 2011 onwards, however, due to the impact of the stagnation of development projects in recent years, the pace of expansion of production capacity will not be able to catch up with the rise in demand. As a result, although demand can just about be satisfied until around 2015, whether demand can be met after that will depend on the new development of oil fields and the exploration and development of undiscovered fields. Figure 2.3 is based on the medium- to long-term oil supply trend according to the IEA's predictions. As this figure clearly shows, in order to meet worldwide demand in the future, not only continuous new exploration and development but also the development of natural gas liquid (NGL) and non-conventional crude oil will be necessary. Therefore, if appropriate investment is not made in advance for this purpose, the gap between demand and supply could widen sharply, once again driving up oil prices.

According to the IEA, 30 million barrels a day of new production capacity will be needed by 2015. It estimates that this figure will increase to 64 million barrels

Figure 2.3. Medium-to long-term oil supply and demand trends



Source: Compiled from IEA, *World Energy Outlook* 2008.

a day by 2030. This is about six times the current amount of oil produced by Saudi Arabia, the world's largest oil producer.

If the oil market functions properly, when the spot price is higher than the futures price, that is, under a tightening of supply and demand, investors have the incentive to sell off short-term futures and make a marginal profit by purchasing longer-term futures at a relatively lower price. This results in additional crude oil being supplied to the market and, since investment in new exploration and development or improvement in technology is stimulated, a medium- and long-term balance between supply and demand can be maintained. Therefore, even if the capital cost of new exploration and development rises in the future due to technological restrictions or other factors, as long as the oil price is sufficiently high, additional investment will be made and production capacity should increase.

In view of these technological factors, the IEA expects the oil price to average $100 a barrel from 2008 to 2015, increasing to $120 a barrel ($200 a barrel in nominal terms) by 2030. This means that total investment of $9 trillion will be needed for the exploration and development of oil and natural gas by 2030.

(2) Factors Discouraging Investment

In the real world, geopolitical factors constitute a large element of risk. The larger the amount of the investment, the greater the risk of loss. This has discouraged investment in many cases and is a major problem for the supply side.

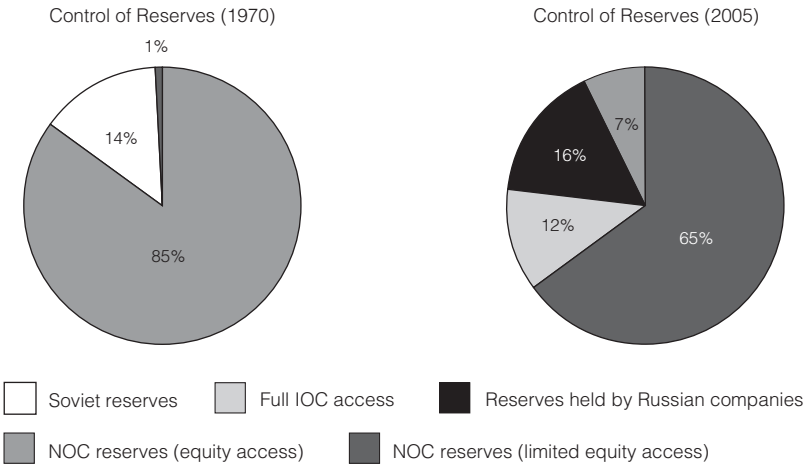
From the viewpoint of production costs (exploration, development, and production expenses, excluding transportation costs and tax), the regions that offer the best conditions in terms of oil reserves and geographical access are Iraq, which has the world's third largest proven oil reserves of 115 billion barrels (9.3 percent) and Iran, with the world's second largest reserves of 138.4 billion barrels (11.2 percent), as of the end of 2007. However, the internal and international tensions affecting both countries have tended to restrict the introduction of capital and technologies from overseas. Together with the deterioration and maturing of existing oil fields, this has made it unclear whether production capacity will grow in these countries.

This kind of geopolitical risk is not confined to oil-producing countries. In addition to transport route risks, there are also risks of a relatively short-term disruption in supply, such as a large-scale natural disaster affecting oil-related facilities. When the spare capacity with which producing countries guarantee a rapid increase in production at such times is insufficient, or when there is no international system of cooperation such as the release of stocks and mutual assistance upon supply disruptions, these risks may lead to a rapid rise in prices. Vast investment is needed to push up spare capacity, but without sufficient stability in the producing country, a secure export route, and a stockholding system or other measures to reduce the impact of geopolitical risk, such investment is discouraged, creating a vicious circle.

The strengthening of national control of resources by producing countries, which has been in the spotlight in recent years, is another factor that might disrupt investment. Increased national control of resources during a rapid rise in energy prices is particularly likely to create an investment constrained vicious circle. Management by resource-rich countries is conducted mainly through national oil companies (NOCs). NOCs are now thought to control more than 80 percent of oil reserves and over 75 percent of gas reserves (see Figure 2.4).

The main motives for strengthening national control are to rectify the income sharing ratio with international oil companies (IOCs), to secure a share of national consumption in anticipation of a rise in domestic demand, and to respond to the

Figure 2.4. Control of oil and gas reserves



Source: NPC, *Facing the Hard Truths about Energy*, p. 170.

dissatisfaction of citizens who think their country is gaining too little income from its own resources. There are also other motives, such as a reaction to the outflow of wealth accompanying excessive privatization, as in the case of Russia. Based on the "permanent sovereignty over national resources" guaranteed by the UN in 1962, producing countries with these motives have been limiting the operations of IOCs within their borders through taxation or contracts and asserting greater national control over natural resource development. This trend is known as "resource nationalism."

(3) The Impact of Rising Energy Prices on Security

In view of the projected rise in energy prices, nuclear power has become an attractive option in the energy policies of consumer countries. It is undeniable that such countries' pursuit of self-sufficiency by increasing the proportion of nuclear power generation may lead them to acquire nuclear fuel cycle technology. This increases the potential risk of diversion of nuclear power from civilian use to weapons as well as the risk that nuclear materials or technologies may fall into the hands of terrorists.

The producing countries pursuing resource nationalism deliberately manipulate

access to their resources based on the logic of politics rather than the market. In this way, depending on the conditions, certain countries with few means of influence other than their possession of energy resources may acquire power that enables them to exert greater influence in the international system. In other words, with the increase in demand for energy, we face the problem that oil and natural gas are becoming strategic goods that might be used for geopolitical leverage.

3. The Food Problem and Security

(1) The Surge in Food Prices

The worldwide rise in food prices has had a major impact on the lives of ordinary people, particularly in developing countries. The prices of the main cereal crops have all soared. The market price of wheat, which had trended at around $200 a ton until May 2007, went higher than $500 in February 2008. The price of corn, which had ranging between $140 and $190 a ton, leaped to over $300 in May 2008. And the price of soybeans, formerly between $250 and $300 a ton, reached $600 in June 2008. Rice (Indica rice), the main staple of the Asian diet, more than tripled in price from $250 a ton in June 2007 to $800 in April 2008. This surge in food prices has led to protests and violence in countries such as India, Indonesia, and Bangladesh.

In the Philippines, demonstrations against rice traders were organized to protest against rice shortages and in one incident Communist guerillas set fire to a rice trader's trucks. On April 16, in the National Capital Region in Manila, the Philippines' National Food Authority directly sold rice imported from Vietnam without going through wholesalers or retailers, and even mobilized the army to guard the operation. In a speech in January 2008, World Bank President Robert B. Zoellick warned that high food and energy prices might trigger social unrest in 33 countries. The international community faced great pressure to respond quickly to this crisis. In April 2008, the UN World Food Programme (WFP) announced a plan to provide $500 million in emergency aid. In the same month, US President George Bush instructed the Department of Agriculture to provide $200 million in emergency food aid through the United States Agency for International Development (USAID).

In April 2008, amid this continuing increase in food prices, UN Secretary-General Ban Ki-moon stressed the need for short-term emergency measures to

respond to the food price surge and food shortages. He called for an emergency meeting of the World Food Summit, which took place in Rome the following June. At this meeting, Ban Ki-moon reported that 850 million people in the world were short of food and that this figure could rise by a further 100 million in the near future. In a speech at the Rome summit, WFP Executive Director Josette Sheeran explained that the number of people requiring food assistance was rapidly increasing. For example, the WFP's 2008 plan aims to provide food assistance for 90 million people worldwide, but this figure is 15 million higher than the WFP's initial projection. The surge in food prices is of course a major blow for low-income groups. For instance, the WFP aims to provide assistance for 1.7 million people in Haiti, but it is estimated that the actual number requiring aid may be as many as 5 million. Japanese Prime Minister Takeo Fukuda, who attended the summit, announced that Japan was prepared to release a total of 300,000 tons or more of imported rice.

(2) Causes of and Responses to the Surge in Food Prices

The surge in food prices in recent years can be attributed to the following five main causes:

(a) Crop failures caused by unseasonable weather patterns

Droughts occurred for six successive years in Australia, a major wheat exporting country, reducing the amount of wheat supplied to the international market. In Myanmar, a cyclone delayed rice planting, and the Myanmar representative of the UN Food and Agriculture Organization (FAO) has predicted a decrease in the 2008 rice harvest of about 30 percent compared to the average year.

(b) Dietary changes mainly of citizens of emerging countries, such as China and India

In these countries, people now eat significantly more meat and dairy products. Pork production in China rose from 9 million tons in 1978 to 52 million tons in 2006, accounting for almost half the world's pork production. This has led to greater demand for cereals as fodder for livestock and, together with the increase in the amount of crops directly used by humans for food, total demand for cereals has increased considerably.

(c) Rising costs due to the rising price of oil

The rising price of oil has led not only to increased chemical fertilizer prices and crop transportation costs but also to mounting costs of operating agricultural

machinery such as tractors and combine harvesters.

(d) Flow of investment into food commodity markets, spurring further price increases

Food commodities have been increasingly converted into financial instruments. The investment funds of oil-producing countries arising from China's current account surplus and the rising price of oil attained excess liquidity and initially poured into the US stock market. They subsequently left the stock market and flowed into food and other commodities markets.

(e) Increased production of biofuels stimulated by awareness of environmental problems

In addition to the soaring price of oil in recent years, R&D and use of biofuels have been widely promoted with increasing international awareness of the need to reduce carbon emissions related to global warming. Corn is used to produce ethanol as a substitute for gasoline, while rapeseed and soybeans are used to produce biodiesel fuel as an alternative for light oil.

These five main causes had a combined impact that brought about the rise in food prices. In particular, the fact that one of these causes was an environment issue is a noteworthy characteristic of this surge in food prices.

From the second half of 2008, market prices of food declined significantly. However, as World Bank Managing Director Juan-Jose Daboub stated in May 2008, the surge in food prices in recent years is not a temporary phenomenon that can be eliminated in just a few months. It has been pointed out that, as a result of the global financial crisis originating with the US subprime mortgage loan problem, the credit-creating capacity of financial institutions mainly in advanced countries has declined and absolute demand for fund management has decreased. To prevent the financial crisis from getting worse, the US Federal Reserve Board (FRB), European Central Bank, Bank of England, and Bank of Japan have been reducing key interest rates and increasing the flow of capital. It is possible, therefore, that investment funds that cannot find profitable outlets will pour into food commodities even more than before. Since the amount of the world's foods traded in commodities markets is less than the amount consumed, the market itself reacts sensitively to supply and demand trends. Supply and demand were stable when the world grain stock ratio (stock volume against annual consumption) was over 30 percent. However, partly due to increasing demand for food as raw materials for biofuels, the grain stock ratio dropped to 15 percent in mid-2008,

below the 17 percent level the UN considers appropriate. As a result, the food commodities market has been reacting more sensitively to small inflows of investments.

One short-term measure for increasing food supply is to increase aid to countries with food shortages and remove export restrictions. For instance, major rice-exporting countries such as Vietnam (the world's third biggest rice exporter in 2007), Indonesia, India (the world's second biggest rice exporter), Bangladesh, Egypt, and Brazil restricted their exports to stabilize domestic rice prices, but thanks to good harvests these export restrictions were lifted in India (partially) and Vietnam by May 2008.

As a long-term response, it is essential to increase food production capacity, particularly in developing countries that are strongly affected by the food crisis. At the Fourth Tokyo International Conference on African Development (TICAD IV) held in Yokohama in May 2008, the Yokohama Action Plan was adopted as a road map for the support of African growth and development. As actions that should be taken in the next five years, the Action Plan proposed not only to "enhance capacity to increase food production and agricultural productivity," but also to "improve access to markets and agricultural competitiveness" and "support sustainable management of water resources and land use" to create the optimal environment for agricultural production. However, although it is understood what has to be done, the problem is whether the plan can be implemented. According to the Philippine daily newspaper *The Inquirer* on April 25, 2008, the Philippines needed to import 2.2 million tons of rice in 2008, but due to the price surge the National Food Authority had at that point only managed to procure just over 320,000 tons. One reason for this is that although the Philippines passed the Agriculture and Fisheries Modernization Act in 1997 with the aim of improving the international competitiveness of its primary industries, it has not succeeded in providing sufficient funds for its implementation.

(3) Increasing Interest in Biofuels

One noteworthy feature of recent years has been the emergence of "biofuels" made from plants, such as alcohol fuel, as a factor contributing to the surge in food prices. Among measures to counter global warming, biofuels have been attracting much attention because they are virtually "carbon-neutral," i.e., do not increase carbon emissions. The reason for this is that, even though carbon dioxide is emitted

by burning plants, these plants have absorbed carbon dioxide in the process of growing, so there is no change in the amount of carbon dioxide in the atmosphere. The fact that biofuels are non-exhaustible resources unlike oil or natural gas, whose reserves are limited, has also spurred their development and use.

In the United States, the world's biggest consumer of oil and biggest emitter of greenhouse gases, President Bush signed the bipartisan Energy Independence and Security Act in December 2007. This requires fuel producers to use at least 36 billion gallons of biofuel by 2022. If this target is achieved, biofuel use in the US will increase by about five times the present amount. This means that biofuel will account for 140 million kiloliters, or 15-20 percent, of road fuels by 2022. The United Kingdom is implementing a plan known as the Renewable Transport Fuel Obligation (RTFO), which requires the conversion of 5 percent of road fuels to biofuels by 2010. The EU is also planning to increase use of renewable energy (including solar energy, water power, and wind power as well as biofuels) by 20 percent compared with 1990 levels and to increase the use of biofuels to 10 percent of all transport energy consumption by 2020. The introduction of biofuels is well underway in Brazil, which plans to further increase biofuel use from 16 percent to 20 percent of road fuels. Indonesia, formerly an oil-exporting country, became a net oil importer in 2004. Since Indonesia's oil resources are likely to dry up in the near future, it is introducing biofuels and other forms of oil-alternative energy. It has set the target of making biofuels 5 percent of its primary energy supply by 2025, and a presidential decree has been issued to encourage the cultivation of biofuel sources such as sugarcane and cassava. However, the promotion of biofuel use in Indonesia has led to new problems. For example, in the West Kalimantan region, the expansion of oil palm plantations for production of the biofuel source palm oil has created so many "biofuel refugees" that the UN has issued a warning to Indonesia. In Japan, the government has set the target of introducing biofuels worth 500,000 kiloliters of crude oil by 2010 as part of its plan to meet its commitments under the

Kyoto Protocol. Total world investment in biofuels rose from $5 billion in 1995 to $38 billion in 2005, and is expected to exceed $100 billion by 2010. The FAO estimated in 2007 that the amount of cereal crops used for biofuel production would rise to 93 million tons.

In these ways, countries all over the world have been taking positive steps toward the practical use of biofuels. At a press conference in May 2008, US Secretary of Agriculture Edward Schafer stated that the production of biofuels only had a 2-3 percent impact on the steep rise in food prices. Furthermore, when a crop such as sugarcane is used for biofuel production, there is no competition with food. It is also pointed out that, even when plant-based fuels are produced or used, they are often not "carbon neutral" if fossil fuels are used in the production process. Particularly in the United States, the consumption of large amounts of fossil fuels in the production and transportation of biofuels may even have the effect of increasing the environmental impact. The UK think tank Policy Exchange has reported to the British government that the introduction of biofuels is not an efficient means of reducing carbon emissions. According to this report, protecting forests or introducing nuclear power generation would be more cost-efficient if the aim is only the reduction of carbon emissions.

The US Air Force is currently working on the use of biofuels for aviation fuel, although this is still at the research and development stage. In March 2008, it conducted a supersonic demonstration flight of a B-1B bomber using biofuel at Dyess Air Force Base in Texas. The following July, a supersonic biofuel flight test by an F-15 fighter was made. And in August, a mid-air refueling experiment between an F-22 fighter and a KC-135 aerial refueling plane was successfully completed. The fuel used in these tests was a 50:50 blend of biofuel and the conventional jet fuel JP-8. The results are thought to have shown that use of this synthetic fuel presents no problems compared to 100 percent use of JP-8. The US Air Force plans to use the synthetic fuel in all of its aircraft by 2011. In February 2008, the civil airline Virgin Atlantic conducted a flight test of a passenger jet using biofuel, and other airlines in the United States, the Netherlands, and New Zealand have completed or are planning to conduct similar tests. In January 2009, Japan Airlines (JAL) implemented the first biofuel flight test in Asia. Furthermore, now that most naval vessels of major countries have gas turbine engines, once the feasibility of biofuel as a fuel for aircraft jet engines has been confirmed, it is highly likely that this will open the way for its use in naval vessels too. The British

Navy is reported to have embarked on a study of the effects of using biodiesel fuel, which is a type of biofuel, in the gas turbine engines of naval vessels.

The use of biofuels does not only contribute to the reduction of greenhouse gas emissions. In view of the expected rise of the oil price in the long term, it can also halt the increase of fuel costs by using synthetic fuel. Moreover, if a major cereal-producing country such as the United States uses biofuels as military fuel, its domestic production ratio for fuel would increase, which could also be expected to reduce its dependence on fuel imports from geopolitically unstable countries.

(4) The Impact of the Rise in Food Prices on Security

Rising food prices directly affect the lives of people with low incomes. WFP Executive Director Josette Sheeran points out that most families in developing countries spend more than 70 percent of their household income on food, and that the situation is particularly critical for children, refugees, internally displaced persons, and the urban poor. This is not only a problem in developing countries or countries undergoing continuing conflicts. In emerging countries like China and India, which are experiencing both rapid economic growth and a widening income gap, rising food prices will further widen the income gap. This will lead to social instability in these emerging countries too. In countries that are not food self-sufficient, the impact of sharply rising food market prices is more serious than elsewhere, and is expected to lead to political or social disruption. Countries such as North Korea, the Philippines, Malaysia, Bangladesh, and Sri Lanka are not self-sufficient in their staple food rice. Even in rice-exporting countries like Thailand and Vietnam, not all rice farmers are benefiting from the food price surge. Since most small farmers only produce rice for their own household consumption, only the large-scale farmers profit from the rise in market prices. As a result, the income gap in rural areas is said to be widening in rice-exporting countries too.

The rise in food prices is thus increasing the number of poor people, mainly in developing countries. Generally speaking, poverty is not considered to be a direct cause of terrorism. However, poverty and terrorism are certainly not unrelated. People who have experienced poverty in their community occasionally resort to terrorism to break the deadlock when they lose hope of improving the situation by lawful or peaceful means.

If the governments of developing countries cannot adequately deal with

sharply rising food prices, the only alternative is to calm the situation through aid from advanced countries and international organizations. However, as the advanced countries struggle to cope with the worsening of their domestic economies amid the financial crisis, sharply rising food prices will increase the burden of food aid. When a food crisis occurred in Haiti in April 2008, a spokesperson for the WFP stated that it could not provide sufficient aid due to lack of funds. When the WFP, one of the international organizations expected to play a central role in responding to food crises, first formulated its plan in 2007 for the following year, it planned to provide food aid for 73 million people in 78 countries in 2008. When it drew up this plan, the WFP estimated the necessary expenses at $3.1 billion, but with the large rise in the prices of oil and cereals, an additional budget of $755 million was needed just to implement the plan. The WFP Secretariat also projected that, since the number of people requiring aid had considerably increased since the plan was formulated, a total of $4.3 billion would be needed for the 2008 project. The WFP depends for its administration on voluntary contributions from member countries, but as of April 2008 it had only succeeded in securing funds of $1 billion. In a speech in November, WFP Deputy Executive Director John Powell said that it would be 40 percent more expensive than the previous year just to implement normal food aid (for 90 million people in 80 countries). The rise in food prices has thus had a heavy impact on projects to assist refugees and others suffering from food shortages.