Regional Energy Cooperation for Sustainable Development: Northeast Asian Perspective

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Abstract

This paper aims to evaluate how the Northeast Asian energy cooperation can contribute to sustainable development of the countries in the region as well as the region as a whole. There are many features of the region pertaining to the energy sector and implications for sustainability thereof. Examples include; rapid economic growth and the energy needs to support it, increasing dependence on the Middle East for energy, increasing energy consumption and resulting environmental degradation; the diversity of economic and social systems and the wide disparity in the degree of economic development; and the huge investment requirement for energy infrastructure and financing gap. Upon looking at these elements in the context of sustainability, the paper concludes that there are many win-win opportunities in the energy sector for sustainable development among the countries in the region, particularly in terms of economic sustainability and environmental sustainability. Main contributing factors are found to lie in, among others, the complementarities of energy demand and supply structure in existence in the region -- the coexistence of energy reserves and energy markets -- and the large potential for energy efficiency enhancement. The abundant reserves of natural gas and hydro resources in Far Eastern Russia and East Siberia, once developed and connected to the market, seem to be able to add greatly to the environmental quality of Northeast Asia. The paper also implicates that the sustainable development potential in the region will contribute to that at a global level, for example, by providing investment opportunities and enhanced environmental quality to the nations outside the region.

1. Introduction

Sustainability in the energy sector is said to have three dimensions, namely, economic, environmental, and social dimensions. Economic sustainability is closely related to energy supply security in that without secure energy supply a continued and stable growth of per capita real GDP is hard to achieve. Recent enthusiastic activities to improve or at least prevent further deterioration of the environmental quality are particularly grounded on the so-called "evolutionary imperative", a commitment that draws more attention to the welfare of future generations in the long-run energy policymaking. More participation in social decision making of diverse stakeholders and more incorporation of wider range of values such as equity are encouraged to take account of the social dimension of sustainable development.

Recently, the world authoritative organizations or commissions have recommended many policy measures for sustainable development. In particular, they put an emphasis on regional cooperation, for there is relatively larger room for enhanced energy supply security, increased energy efficiency and resultant lower environmental degradation through cooperation by countries in a regional market. Major contributing factors include comparative proximity of energy supply sources and consuming markets and increased capacity factors of energy supply facilities.

In the Asia-Pacific region, there are international cooperative energy projects that are being undertaken and some discussions are underway for future cooperation. Southeast Asian countries are at forefront in advancing regional energy cooperation mainly through the Trans-ASEAN energy network project. In Northeast Asia, an active discussion is underway on a variety of potential international cooperative projects, particularly those of cross-border energy projects. They include projects of interconnecting natural gas and electricity systems and joint oil stockpiling among the nations in the region. It is believed that the regional energy cooperation, once realized, would greatly contribute to the sustainable development of the region as well as the world, since it would not only enhance the energy supply security and energy efficiency of the region but also ensure that the huge reserves of environmentally friendly energy sources are utilized. In short, the Northeast Asian energy cooperation is regarded as one of the keys to the sustainable development of the countries in the

region.

Although there are large win-win opportunities among the countries in the region, it is also true that some challenges lie ahead, particularly because there has never been a multilateral energy cooperation project undertaken and because there is a wide range of differences among the nations in the region. Moreover, the huge capital requirement for energy infrastructure development and the risks involved are considered an important issue to be resolved in order for the concept of regional energy cooperation to make way.

This paper aims to look at the sustainability potential of the Northeast Asian energy cooperation and to report on the current development in the discussion of the concept and implications thereof. In the next section, regional energy cooperation is introduced as an effective tool for sustainable development, followed by a section of a brief discussion about recent technological advances that have contributed to cross-border energy cooperation. A broad picture and discussions of the Northeast Asian energy cooperation are presented in the few following sections and the last section concludes the paper with short remarks.

2. Policy Measures for the Sustainable Energy Sector

In the Ninth Session of the Commission on Sustainable Development (CSD) in New York in April 2001, a sustainable energy system was defined as one that ensures adequate and affordable access to energy for present and future generations in an environmentally sound, socially acceptable and economically viable way.[1] On the other hand, OECD/IEA suggests having a working definition of sustainable development in the context of energy policy-making, namely, 'development that lasts' and that is supported by an economically profitable, socially responsive and environmentally responsible energy sector with a global, long-term vision.[2]

The CSD concludes that although a sustainable energy system is in the core of sustainable development, the current energy system is not sustainable. It points out a

[1] CSD-9 Decision 9/1, p. 1, paragraph 3.

few problems that stand in the way toward a sustainable energy system: one-third of the world's 6 billion inhabitants are denied the modern energy and transportation; there are huge gaps in the level of energy consumption between developed and developing countries and within countries; and the current modes of production, distribution and use of energy are not sustainable. The Commission recommends several key tools for achieving a sustainable energy system as follows:

- research and development;
- capacity building;
- technology transfer;
- information diffusion;
- fiscal health;
- utilization of price mechanism;
- participation of public and interest groups; and
- regional cooperation.

The World Summit on Sustainable Development (WSSD) held in Johannesburg in August 2002 reaffirmed that individual governments should implement the recommendations and decisions made by the CSD to make the energy sector support sustainable development. Notable policy directions for the purpose of this paper include:

- improve functioning of energy markets;
- strengthening international energy cooperation;
- enhancing access to energy;
- strengthening cooperation between international and regional organizations;
- strengthening regional cooperation to facilitate cross-border energy trades; and

[2] IEA, *Toward a Sustainable Energy Future*, 2001, p. 4.

- strengthening dialogue forums between producing countries and consuming countries of energy.

Before the CDS and WSSD recommendations, the World Energy Council set, in its WEC Statement 2000, three energy goals that every national and international institutions had to follow; accessibility, availability, and acceptability. Accessibility refers to the provision of reliable and affordable modern energy services for which a payment is made. Availability dictates that quality energy service should be provided with reliability. Accessibility addresses environmental goals and public attitudes. The Council recommended ten policy actions that, they thought, covered the most important issues in sustainable energy development until 2020.[3] It seems that the actions – although they seem rather to be goals than measures – have profound implications on regional energy cooperation. For example, in order to reduce the political risk of key energy project investments and to promote greater energy efficiency, certain cooperative schemes between nations will be effective means.

In sum, the various organizations, commissions or councils related to energy policy-making put an emphasis on a common theme, that is, regional energy cooperation as an effective tool for the sustainable energy sector.

3. Sustainability-Supporting Technological Development

Underlying the recent development of energy infrastructure are technological, environmental and economic reasons. Combustion of natural gas produces significantly lower levels of carbon dioxide, hydrocarbons and nitrogen oxides compared with other fossil fuels such as coal and oil, making switching to gas have the merit of improving air quality. Major environmental impacts associated with hydrocarbon combustion are: local air pollution such as SO_2, NO_x and particulate emissions (in the vicinity of large fossil fuelled power plants and in big cities with heavy traffic congestion); regional problems such as acid rain and acid deposition on

[3] World Energy Council, *Energy for Tomorrow's World—Acting Now!*, WEC Statement 2000, 2000, pp. 6-12.

lakes and forests; and global problems which are a direct result of emissions of greenhouse gases, in particular, carbon dioxide.[4]

Table 1 Gaseous Emissions from Fossil Fuelled Power Plants (g/kWh)

	SO_2	NO_x	CO_2	Thermal Efficiency (%)
Gas (Combined Cycle)	~0	0.5-2	370	50
Integrated Gasification Combined Cycle	0.1-1	0.5-1	790	42
Oil (Combined Cycle)	1-2	2-3	540	49
Coal (Pulverized)	8-20	3-5	860	37
Coal (W/Scrubber)	1-2	4.7	880	36

Source: Reproduced from APERC, Natural Gas Infrastructure Development: Southeast Asia, 2000.

Technological development in power generation, combined cycle gas turbine (CCGT) technology in particular, contributed much to lower greenhouse gas emissions and higher thermal efficiency from using more gas in power generation. While the highly efficient CCGT technology has resulted in more use of natural gas in the power generation sector, the CCGT technology development itself was also stimulated by the abundance and the environmentally friendly characteristic of natural gas. The table below shows a comparison of emissions from power generation by fossil fuels. Natural gas-fired power generation is superior in terms of thermal efficiency and emissions to other forms of power generation using different fossil fuels. At around 50 percent thermal efficiency for modern gas-fired combined cycle plants, it exceeds that for other fuel sources. The thermal efficiency is expected to reach 56-60 percent by 2010. SO_2 emissions are negligible, NO_x emissions vary from one to six times less than emissions form oil-fired plants, and six to ten times less than those of coal-fired plants depending on plant design. Carbon dioxide emissions are

[4] APERC, Natural Gas Infrastructure Development: Southeast Asia, 2000.

also about 70 percent less than oil-fired plants and more than 100 percent less than for coal-fired plants.

Another technological aspect that was important in the development of recent power interconnection discussion is the high voltage direct current (HVDC) transmission. It becomes increasingly difficult to obtain permission to install new power lines mainly due to environmental concerns. However, the transmission capacity may be increased in the existing corridors by changing the lines to DC lines. It is reported that DC lines have dual advantage of allowing higher transmission capacity with less loss over long distance and reducing the need to obtain additional right of way. Moreover, DC interconnection and transmission do not require so rigorous operation and cooperation between systems as AC networks do.[5]

There is another important supporting technology for the energy infrastructure development, especially in the interconnection of separate systems and in the development of competitive market arrangements, is the information technology (IT). While the technology may be more important in a closed energy system in maintaining system security and providing information to market participants, it also makes it possible to control even long-distance energy transportation with sophisticated electronic control.

This IT development and its capability of controlling larger interconnected systems have provided the opportunity to exploit the large potential for savings in energy and other real resources and, as a result, for environmental protection at the global level as well as regional level. For example, major savings from power interconnections include: (i) lower operating costs due to economic power exchange, postponed and lower investment in generation due to least-cost development of regional energy resources and reduced spinning reserve costs; (ii) lower coincident peak load (compared with the sum of individual peak loads), mutual access to generation reserves for interconnected systems, a more robust power supply to meet such unexpected events as load growth above forecast or delayed commissioning of generation and transmission projects, and increased system reliability; and (iii) lower greenhouse gas emissions and other pollutants, possibly due to a shift from thermal to

hydro generation where available.[6] The environmentally friendly feature of natural gas and the technology development in system control suggest, albeit not the same, similar benefits from gas pipeline interconnection.

4. Challenges to the Countries in Northeast Asia

The 21st century is often said to be the era of Northeast Asia. The Northeast Asian region at present accounts for 24 percent of the total world population and about 19 percent of total world GDP. The region is experiencing faster economic growth than any other regions in the world, emerging as the center of the world economy in this century.

Table 2 Total Energy Consumption Projection (Quadrillion Btu)

	1999	2005	2010	2015	2020	Annual Growth (%, 1999-2020)
S. Korea	7.3	9.6	10.7	12.0	13.0	2.7
Japan	21.7	22.9	24.2	25.4	26.6	1.0
China	31.9	42.9	55.1	68.8	84.4	4.7
World	381.9	438.6	492.6	551.7	611.5	2.3

Source: Energy Information Administration, International Energy Outlook 2002.

Rapid economic growth in the region is likely to be the motive force behind a massive increase in energy demand in the region. The high rate of energy demand growth is expected to continue into the future, with energy demand in 2010 projected to be 1.6 times the 1995 level. China will be particularly important and is expected to contribute 67 percent to future energy demand growth in the region. Although demand is likely to be greatest in China, it will also be significant in Japan and South

[5] Charpentier, J. P. and K. Schenk, "International Power Interconnection: Moving from Electricity Exchange to Competitive Trade", *Public Policy for the Private Sector*, Note No. 42, World Bank, March 1995.

[6] Crousillat, E., "Developing International Power Markets in East Asia", *Public Policy for the Private Sector*, Note No. 143, World Bank, May 1998.

Korea. In addition, energy demand is expected to increase in North Korea, the Russian Far East and Mongolia.

Gas use has grown by 10 percent a year from a very low base. It still accounts for less than one-tenth of the region's total energy consumption. Coal use has also grown strongly, reflecting its importance in China. However, governments are anxious to tackle the major local and regional pollution it causes.

Even if coal growth slows and gas consumption continues to expand strongly, oil will remain the dominant energy source in the region. Moreover, the region's dependence on the Middle East for oil imports is anticipated to increase to 90 percent in 2020, from the current 75 percent level. Currently, Japan ranks the second largest oil consumer in the world, China third, and Korea the sixth. China became a net importer of oil in 1993. Its estimated annual growth of oil demand at an annual average rate of 4.3 percent for the next two decades implies an almost 80 percent of Middle Ease dependence for oil for this country from the current 46 percent level.[7] This outlook clearly indicates that regional energy security could be seriously threatened in the event of an oil supply disruption in the future.

Table 3 Carbon Dioxide Emissions Forecast (Million TC)

	1999	2005	2010	2015	2020	Annual Growth (%, 1999-2020)
S. Korea	107	136	152	164	175	2.3
Japan	307	327	343	356	370	0.9
China	669	881	1,127	1,393	1,692	4.5
World	6,097	7,018	7,910	8,866	9,850	2.3

Source: Energy Information Administration, International Energy Outlook 2002.

Furthermore, due to the high coal dependency of China and the high oil dependency of South Korea and Japan, the region is as vulnerable as any other to

[7] APERC, APEC Energy Demand and Supply Outlook 2002, 2002.

energy-environment issues. Northeast Asia is expected to overtake North America and Europe in terms of carbon dioxide emissions from energy consumption in the future and is likely to become the focus of interest in future environmental negotiations.

To mitigate energy security risks and address environmental concerns, the theme of strengthening energy cooperation among Northeast Asian countries is particularly important. However, the promotion of regional cooperation is proceeding at a relatively slow pace compared with other regions, despite its enormous potential benefits. This is mainly due to the legacy of past rivalries and conflicts as well as differences among the countries in the region in terms of their economic development. In particular, little progress has been made to date in energy cooperation for the development of energy resources and the construction of energy infrastructure in Northeast Asia – which usually requires a huge amount of capital investment – because this requires substantial mutual trust and cooperation among the countries involved.

5. Northeast Asian Energy Cooperation as a Solution for the Sustainable Future

For countries like Korea and Japan, with few indigenous energy resources, workable schemes on an individual basis to reduce their exposure to energy supply disruption are severely limited. Countermeasures against such factors as fast-growing energy demand and overseas dependency, which could possibly bring about instability in energy supply in Northeast Asia, are perhaps beyond any one country's control. Individually, each country is exerting efforts to improve energy efficiency and promote new and renewable energy forms, but these measures can achieve only limited results in the foreseeable future. Faced with a projected increase in the share of oil in the total primary energy and with an increased dependence on the Middle East, it is imperative that Northeast Asian nations explore other options for energy security.

To mitigate energy supply security risks and to address environmental concerns in

order to pave the way for sustainable development, countries in Northeast Asia need to establish stable, cost-effective, and environmentally sound energy systems. The solution can be found within the Northeast Asian region, for it is endowed with rich environmentally friendly energy resources. It is only needed to start implementing workable cooperative schemes in gear, since the motivation will be well-driven by the need for sustainable development and economic benefits.

One potentially effective scheme is the utilization of natural gas in this region. Natural gas provides a way to lessen oil dependency as well as to address environmental concerns. Already some steps have been taken toward regional energy cooperation. For instance, China, Russia and Korea are jointly undertaking the economic feasibility study of developing natural gas in Russia, specifically in Irkutsk, and transporting it to the regional market through pipelines. Expanding gas use is the most important medium-term solution that can be found to tackle the challenge of the climate change.

Another possibility is that of interconnecting electric power grids across countries. It is reported that excess power would be around 25-30 TWh by 2005-2010 from the Irkutsk, Krasnoyarsk and Chita systems.[8] The problem of excess capacity might be exacerbated if more power capacity in Yakutia should be added after the completion of the cascade of Uchursk hydropower plants, leading to active discussions on possible electric power trades through interconnection. Such energy cooperation among the countries within the Northeast Asian region can strengthen energy security through better diversification of energy importing sources, and provide benefits accruing from the complementary effects of an interconnected energy supply system. In addition, the power generated using natural gas and hydro resources will greatly contribute to the environmental quality both at the regional and global level. Power interconnection in this region would provide a firm foundation not only for economic prosperity but also for mutual trust among the nations owing to the interdependent nature of interconnected systems.

A further area for cooperation is related to oil. Joint stockpiles could enhance the leverage for crude oil prices and allow a safer balance between oil supply and demand.

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[8] APERC, Power Interconnection in the APEC Region, 2000.

Japan is proposing the immediate use of Okinawa as an oil reserve center for Northeast Asia. South Korea is expected to have a surplus storage capacity of 43 million barrels in 2006, part of which has already been leased to Statoil. Japan has 39 million barrels of idle capacity. In the longer run, interested countries can jointly invest in and construct a common reserve. Yet another possible area of cooperation is environmental quality control in oil products. Countries in the Northeast Asian region may get together and agree on the joint use of cracking facilities to reduce the environmental cost of domestic refinery industries. Such a practice can be found in NAFTA and the European oil market.

An additional benefit from cooperation is to strengthen the bargaining power of Northeast Asia's oil consuming countries. Oil consumption in the region accounts for 65 percent of Asia-Pacific oil consumption and 18 percent of world oil consumption. With the expected increase in the magnitude of oil consumption due to China's rapid economic growth Northeast Asia is expected to become the center of world oil consumption.

It appears that the Northeast Asian energy cooperation will not only contribute to solving the problem faced by the region but also promote a cleaner environment and regional prosperity for future generations. Europe has already created a regional energy cooperative body based on the European Energy Charter, and the United States, as announced in its recent new energy policy, is emphasizing the importance of regional energy cooperation, particularly with its neighboring countries. Thus, strengthening regional energy cooperation is a common phenomenon in other regions of the world. Northeast Asia has great potential for a mutually complementary energy cooperation structure in that there are major energy consuming countries – Japan, China, and Korea – and countries with large energy reserve area such as East Siberia, Sakhalin, and Central Asia.

6. Status of the Discussion and Some Challenges

The ground work for regional energy cooperation in Northeast Asia has already been initiated. In June 2001, at the First International Conference for Energy

Cooperation in NEA hosted by the Korea Energy Economics Institute (KEEI), the creation of a working committee to promote multilateral energy cooperation at the government level in Northeast Asia was proposed by the Minister of Commerce, Industry and Energy (MOCIE) of South Korea.

As the first step toward the cooperation, an intergovernmental meeting was held in Khabarorvsk, Russia in October 2001 attended by 57 participants of government officials and experts from six countries of the region, namely, China, Japan, Mongolia, Russia, North Korea and South Korea. At the meeting, a declaration, the Khabarovsk Communiqué, containing the objectives and basic principles of energy cooperation in Northeast Asia was adopted. The agreed objectives for the energy cooperation are: (i) to increase the supply of energy from the Northeast Asian region; (ii) to optimize the efficiency of supply and use of energy; and (iii) to minimize the environmental impact of energy projects through improved energy mix. The basic principles manifested in the Communiqué include: (i) the recognition of sovereign rights over energy resources; (ii) development of free and fair trade; and (iii) investment promotion and protection and environmental protection.

The Khabarovsk Communiqué also recommended institutional arrangements of a 'senior officials meeting' spanning the six countries, a secretariat, and 'working groups' on the following areas: (i) energy planning, programming and restructuring; (ii) emerging energy technology and scientific cooperation; (iii) electric power interconnection; (iv) interstate transit of fossil fuels; and (v) development of the Northeast Asian Energy Charter.

Subsequently, a preparatory meeting aimed at creating a working committee for the Northeast Asian energy cooperation was held in Seoul, Korea in November 2001, and attended by participants from the governments of Japan, Russia, and Korea and from organizations of UN ESCAP, ASEAN/ACE, and KEEI. At the meeting, a consensus was reached to create the working committee for energy cooperation in Northeast Asia and the UN ESCAP is to serve as the interim secretariat.

Following all the developments, the would-be First Senior Officials Meeting was held on April 2003 in Vladivostok, Russia by the initiative of South Korea. It was intended that this meeting would serve as the intergovernmental institutional

vehicle that is critical in moving forward with the implementation of the much desired energy cooperation in Northeast Asia. This meeting was not titled official First Senior Officials Meeting mainly because China and Japan did not attend it.

Despite the non-attendance of certain countries, the participation of international organizations was enthusiastic, including UN ESCAP, ADB, IEA, UNECE and APERC, and progress was made.[9] A regular meeting will be held between senior officials from Russia, Mongolia, North Korea and South Korea. Also, it is agreed that more cooperation will be made through the establishment of 'working groups' in the areas of electric power interconnection, interstate transit of fossil fuels and prospective energy planning and programming. A task force will be formed to formulate the draft Collaborative Framework on Energy Cooperation in Northeast Asia and a draft plan to conduct joint studies on electricity ties that will be submitted to the First Senior Officials Meeting.

There is no doubt that the Northeast Asian energy cooperation has huge potential for mutual benefits to the countries in the region. In addition to the economic and environmental benefits suggested earlier in the paper, it will also play an important role in lessening political tensions in the region, which will in turn work toward lower project risks and costs. It is the most effective solution for the many people's energy poverty and denied access to commercial energy sources particularly in Mongolia and North Korea.

As shown in Table 4, there is huge potential for multilateral energy cooperation considering the resource endowments of the countries in Northeast Asia. However, the state of resource endowments indicates that bilateral cooperative relationship is also attractive to some pairs of countries, for example, between Russia and Japan for resource trade and the need for capital and technology. This kind of pair-wise preferences for specific cooperative schemes may be one of the difficult issues to resolve, and they could work as higher bargaining power in structuring the elements of cooperative schemes like prices and supply conditions of energy. In this regard, there coexist complementarities and competitive relationships in the resource

[9] UN ESCAP, "Vladivostok Statement of Senior Officials on Energy Cooperation in North-East Asia", UN ESCAP Senior Officials Meeting on Energy Cooperation in North-East Asia, Vladivostok, Russia, April 10, 2003.

endowments and the potential for mutual benefits for the countries in the region. Incentives for bilateral cooperation are strong among the countries and the energy cooperation at a regional scale is prone to a piecemeal approach, which is highly likely not maximizing the efficiency of the whole system.

Table 4 Resource Endowments of Northeast Asian Countries

	Oil & Gas	Coal & Minerals	Labor	Capital	Technology	Managerial Expertise
China	B	A	A	D	C	C
Japan	D	C	C	A	A	A
S. Korea	O	C	C	B	B	B
N. Korea	O	B	B	D	D	D
Russia	A	A	D	D	C	C
Mongolia	C	B	C	D	D	C

Note: A – very plentiful; B – plentiful; C – short; D – very short; O – none

Source: KEEI, CEO Energy Briefs, October 31, 2001.

The environmental benefit is one of the major benefits that can result from the Northeast Asian energy cooperation. However, when any specific cross-border energy project is to be launched, the sharing benefits or burdening costs among countries involved regarding environmental impacts could be a major issue. In other words, at the beginning stage of discussion, it may well focus on the overall benefits. On the other hand, when it comes to the actual designing and financial structuring, the sharing of costs and revenues will be the most crucial issue that has to be resolved not only by the countries involved but also by participating financial institutions. The fact that the current effort for the Northeast Asian energy cooperation is the first attempt at a multilateral tie in the region implies that it may take time and efforts to resolve the pricing and cost-revenue sharing issues. In particular, the differing economic systems and energy pricing practices in the countries may be a high hurdle to jump politically, especially when there are many countries involved.

According to a recent estimation by the East-West Center, required net foreign capital inflow to Northeast Asia for energy infrastructure development is estimated to reach at US$7.5 billion a year for several decades in the future.[10] Estimated amount is beyond the region's means, as has been the solution adopted by existing tools like: international financial institutions (notably, IBRD, ADB and EBRD); private direct investment in commercially viable infrastructure projects; and bilateral, government-to-government assistance. Under optimistic assumptions, the region's financing shortfall would amount to US$5.0 billion a year, calculated from the required net foreign inflows of US$7.5 billion and possible supply through the existing tools at US$2.5 billion.

To make even a start in filling the region's projected US$5.0 billion infrastructure financing gap will require a new institutional arrangement created for the purpose of helping to meet more fully Northeast Asia's future capital transfer and infrastructure investment requirements. A new, sub-regional development bank, the so-called Northeast Asian Development Bank (NEADB), could be the most viable and effective institutional option for helping to meet Northeast Asia's projected infrastructure financing gap. It should be noted that while this financing gap is one of the toughest challenges in advancing the regional cooperative scheme, it could also offer a great opportunity to the participants in the capital markets around the world.

7. Concluding Remarks

We have seen that there are tremendous win-win opportunities among the nations in the Northeast Asian region from energy cooperation. Regional energy cooperation has great potential for contributing to sustainable development at the global level as well as at the regional and national level. It contributes not only to economic sustainability through enhanced energy supply security but to environmental sustainability through increased energy efficiency and shared environmental and energy resources. From this perspective, although never tried before, the Northeast Asian energy cooperation seems to be able to meet the regional and global goal of sustainable development if implemented well enough.

[10] Cho, L.-J. and S. S. Katz, "A Northeast Asian Development Bank?", *NIRA Review*, Winter 2001, pp. 41-47.

It is true that there exist incentives for bilateral cooperative relationships among countries and that there are certain fears of increased interdependence perhaps for historical and political reasons. However, most issues may be addressed by economic consideration, since national interests, particularly economic interests, may well take priority faced with the needs of sustainable development in the globalized world. The global interest in the Northeast Asian energy cooperation manifests itself with the recent active participation of international organizations in the discussion of the regional energy cooperation scheme.

There should be many other important issues that must be discussed and settled before or in the course of advancing the concept of the regional energy cooperation in order to materialize its full potential. Among others, it is the private sector that will supply major portion of required capital and technology in energy projects within the framework of the Northeast Asian energy cooperation. They will demand the cooperative projects be operated in a market-oriented manner at a reasonable level of risk. Therefore, the governments of the partner countries need to bear in mind that they should provide for the investment environment that is most amenable to private sector investment even if certain issues are necessarily have to be settled from political concerns.

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