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Natural resources and national security: An ecological interpretation of South Korea's security

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University of Maryland College Park, 1987

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NATURAL RESOURCES AND NATIONAL SECURITY: AN ECOLOGICAL INTERPRETATION OF SOUTH KOREA'S SECURITY

by

Min Yong Lee

Dissertation submitted to the Faculty of the Graduate School
of the University of Maryland in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
1987

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APPROVAL SHEET

Title of Thesis: Natural Resources and National Security: An Ecological Interpretation of South Korea's Security

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Doctor of Philosophy, 1987

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ABSTRACT

Title of Dissertation: Natural Resources and National Security: An Ecological Interpretation of South Korea's Security

Min Yong Lee: Doctor of Philosophy, 1987

Dissertation directed by: Dr. Dennis C. Pirages
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Perception of the importance of ecological issues in international politics has been on the increase since the early 1970s. One factor in the revival of interest is the widely shared concern over potential natural resource shortages resulting from rapid world population and economic growth. Resource problems cause various types of threats to different countries. Among them are starvation, poverty, resource conflicts, and supply interruptions. Many studies in political science have identified ecological issues as important, but few of them have focused on the systematic analysis of growing ecological constraints and their implications for national security.

This study represents an effort to incorporate an ecological dimension into national security planning. Concentrating on South Korea, it explores two general concerns: enhancing carrying capacity, and evaluating supply security. South Korea has a very deficient natural resource endowment despite having one of the highest population

densities in the world. It must import numerous natural resources in order to meet its growing demands. Korea's experience, therefore, facilitates analysis of the impacts of resource constraints on national security performance.

The findings in this study can be generalized into theoretical and policy arguments. First, an adequate supply of natural resources is seen as vital to national security. The recognition of this theme in national policy planning is a prerequisite for the protection of other national security values. Second, foreign trade is seen as an useful instrument to improve a nation's resource position, but heavy involvement in international trade causes other security problems of sensitivity and vulnerability. Third, national supply security is determined by the varying supply conditions and the variable policy planning to avoid any supply interruptions.

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CHAPTER ONE

INTRODUCTION

Growing Attention of Resource Problems

Since the early 1970s, there has been an explosion of interest in ecological issues. The importance of ecological issues in international politics derives from the combination of world population growth and technological developments that have placed increasing strains on the earth's life-support systems. Dislocations in natural resources such as food, fossil fuels, and other non-renewable minerals, are already salient in many countries, and they can be expected to grow. The two oil crises and widely dispersed starvation in the developing regions are enough to prove that we have already entered into an era of limits. The global commons, such as the oceans, the seabed, and outer space, previously regarded as the common heritage of mankind, are now becoming the source of conflict in international relations, due to the competitive exploitation among nations.

The revival of interest in ecological factors, such as population, resources, and technology, has been manifested in a burgeoning literature focused upon the implications of population growth for resource scarcity, the implications of

resource scarcity for potential conflict, the relationship between resources and geography, and the impact of technology upon resource availability. One of the most impressive development during the 1970s was an effort to forecast future economic and ecological systems at the global level. Of special interest were future resource availability and its impact on industrial growth. Two competing images, which have their own intellectual roots in the older political philosophy, again attracted our attention to this concern. Environmental optimists foresaw rising standards of living as the benefits of science and technology become available to all the peoples of the world, keeping with liberal and Marxist thought of the nineteenth century. By contrast, environmental pessimists predicted a global disaster if economic and population growth were not sharply reduced.[1]

Despite vigorous efforts to forecast the future, both optimistic and pessimistic perspectives have proved not only inconclusive, but essentially meaningless. These results are due to underlying assumptions rather than forecasting techniques. Regardless of what conclusions they derive, it is seldom taken into account that nations greatly differ in resource availability. As in the past, nations faced with resource scarcity witnessed the continuous struggle of their people for survival. In addition, given the absence of legitimized authority on the global level, any futurist's conclusion is hardly valuable for arriving at a viable

policy for the global security. It is reasonable, therefore, to argue that we should concentrate our attention on the issue of resource availability and the implications of resource problems for foreign policy and security of a nation.

Every political community exists on a territory that provides limited vital resources, such as energy, food, living space, heat, non-renewable resources, and water. In ecological point of view, these combined essential resources, found on any piece of territory, allow for expansion of population. All natural populations tend to expand to nearly fill available resource space until their expansion is halted by the resource in shortest supply.[2] Today, it would be difficult to identify any country that can support its people within its present domestic resource constraint.

Resource problems of nations are not a phenomenon salient only in context of current international politics. The historical roots of territorial expansion by most European countries can be best attributed to the combined factors of resource scarcity and technological capability. During the period of expansion, growing populations, technological development, and rising expectations for consumption caused the resource deficiencies of European countries, thereby pushing expansion of colonial empires.[3] Furthermore, history is full of examples to support that nations have gone to war to assure supply of resources. In

recent times, short-term problems of resource scarcity have been overcome by combinations of new technologies or substitution, the development of new trade routes, and changing political alignments. But, it is still validate to assert that access to resource abundant spheres is an important security agenda among many countries.

Ecological Environment of the Third World

It should be emphasized that nations differ in their resource availability. In general, there is a significant disparity between developed and developing countries in resource consumption. The growing resource demands of developed countries could be sustained by certain options that include military, economic, and technological instruments, without suppressing their consumption levels. These options are presumably not available to the same degree for developing countries. The result is that many developing countries still remain at the stage of poverty. Thus, the issue of resource scarcity in this region involves a matter of physical survival.

Developing countries experience constant population growth. The introduction of advanced medical care since World War II has lowered death rates while birth rates have remained extremely high. Whereas many developed countries have virtually reached zero population growth, many developing countries are experiencing population growth

rates in excess of three or four percent annually. Relatively speaking, the population of developing countries already exceeds that of developed countries, as we can see in the population densities of arable regions.

Table 1-1

However, the level of developing countries' economic capacity is too low to cope with mounting population pressures. Economic conditions vary considerably among these countries. For example, Saudi Arabia and Kuwait almost attained as high an income level as developed countries, because of their natural fortunes. But, most developing countries lag far behind developed countries in terms of average annual income. This condition has brought chronic food and energy shortages as a daily reality. Current reports estimate that approximately 500 million of the world's people suffer from malnutrition.[4] Although food production in the developing world has increased, it has not outstripped the level of demand. As a result, many countries, such as India, Bangladesh, Ethiopia, Somalia, and Chad, have gone through severe experiences of food shortage. In Africa alone, it is known that 5 million children died from hunger-related causes in 1984.[5]

If we look at the agricultural production of developing

Table 1-1: Current Population Densities and Growth Rates

Region	Population (in millions)	Arable land (in millions of hectares)	Population/ land ratio (pop./hectare)	Population growth rate(in %)
Developed West	928	235.9	3.93	.8
Developed East	387	189.3	2.04	.75
Developing Countries				
Latin America	363	92.2	3.94	2.6
Africa	374	110.0	3.40	3.0
OPEC	362	14.0	25.86	2.7
South Asia	1,153	234.0	4.93	2.1
PRC	1,111	178.3	6.23	1.2

Sources: Food Agricultural Organization, FAO Production Yearbook (Rome: FAO, 1985); United Nations, Demographic Yearbook 1983 (New York: 1985).

countries, we seldom realize that their capacity to provide food increased. During the last two decades, the agricultural production of the Third World rose at an annual rate of 2.8 %. Since the population increased at an annual rate of 2.4% during these two decades, agricultural production per capita remained virtually stagnant for twenty years.[6] On the other hand, their total consumption has increased more rapidly because of a rise in per capita income. Since 1960, food demand has increased by an average of approximately 3.5% per year; the margin between food production and consumption has been filled by imports, constituting a serious drain upon foreign exchange earnings.

The dependence of developing countries on food imports has been increasing. In 1973-74, the developing countries that depended on food imports for 10% or more of their cereal consumption were South Korea (27%), Egypt (20%), Bangladesh (16%), and Brazil (10%). In the 1980s, a growing number of countries are becoming dependent on food imports, thereby deteriorating their self-sufficiencies. Table 1-2 shows that from 1934 to 1938, only Western Europe was a significant regional importer. Recently, Western Europe has become less dependent on imports. All developing regions shifted from balanced, or net exporter, status to net importer status by the late 1970s. The most significant changes of the 1970s were the entry of Africa, the USSR, and Eastern Europe into the global market in major volume, supported by an expansion of United States exports. The

growing African dependence on food imports is of serious concern because of the poverty of the continent and the scarcity of foreign exchange with which to buy food.

Table 1-2

As for energy resources, the increase in the Third World's consumption of commercial energy has been rapid, although their share of world consumption remains at the low level of approximately 20 percent. In Table 1-3 we see the distribution of global energy consumption over the last thirty years. Among the other aspects of interest in the table is the steadily increasing portion of global energy consumption in the Third World. The Third World countries rely on oil for their energy supply even more than the industrial countries do; their oil consumption increased annually by about 7 percent from 1965 to 1980, and today oil accounts for about 57 percent of their commercial energy supply. Their remaining energy needs are covered by solid fuels (19 percent of the supply), natural gas (12 percent), the remaining 12 percent being assured mainly by hydroelectric power.[7] For various reasons, commercial energy consumption will increase rapidly in the Third World during the coming decades. The total energy demand of these countries will grow considerably because of the requirements

Table 1-2: Annual World Grain Trade (Annual averages in millions of tons)

Region	1934-38	1948-52	1953-60	1961-70	1971-78	1983-84
1)North America:	+5.3	+22.4	+27.6	+50.6	+95.4	+123.4
2)Western Europe(+ Japan):	-25	-24.6	-26.6	-34.5	-39.4	-22.2
3)Oceania:	+2.8	+3.4	+3.1	+6.8	+12.2	+14.0
4)Eastern Europe/USSR:	+5	+1.1	0	-3.0	-24.5	-37.6
5)Latin America:	+9	+0.9	+1.4	+2.7	0	0
6)Africa:	+0.6	-0.3	-0.4	-4.1	-10.5	-12.7
7)Asia:	+0.3	-3.4	-4.8	-18.3	-32.0	-65.5
5 + 6 + 7:	+9.9	-2.8	-3.8	-19.7	-42.5	-78.2

* Plus signs indicate exports; minus signs, net imports

Sources: For the period of 1934-78, Lester R. Brown, Food or Fuel: New Competition for the World's Cropland (World watch Paper 35, 1980), p. 32; Jacques Loup, Can the World Survive? (Baltimore and London: The Johns Hopkins University Press, 1983), pp. 90-91. The figures for 1983-84 were estimated by FAO data: FAO, Commodity Review and Outlook 1984-85 (Rome: FAO, 1985), pp. 61-65.

of economic development, industrialization, and urbanization. One estimate puts growth of developed countries' energy demand between now and the end of the century at 50 percent, compared to 200 to 250 percent growth in the Third World.[8]

Table 1-3

On the other hand, technological development and industrial growth can enhance physical well-being of developing countries, as in the case of Western countries. But most technological advances are occurring in developed countries. It can be argued that there are positive relationships among the number of scientists at work, the level of spending on research and development (R & D), and the rate of scientific discovery. Developed countries now have 20 times as many scientist and engineers per capita as developing countries. The North-South imbalance is ever more significant when we look at the priorities of R & D: 24 percent of spending goes to the military and 8 percent to space. The category of most obvious relevance to developing countries, agriculture, receives only 3 percent of global expenditures.[9]

Table 1-3: Percentage Distribution of Global Energy Consumption

Region	1950	1960	1970	1980	1983
North America	50.0	38.9	37.2	30.6	30.5
Western Europe	22.2	19.7	20.1	18.2	16.6
Eastern Europe/USSR	17.5	22.1	22.4	24.6	26.3
Japan	1.8	2.4	5.0	5.0	4.7
Oceania	1.0	1.0	1.1	1.2	1.2
Latin America	2.5	3.1	3.7	5.0	5.1
Middle East	0.3	0.7	1.1	1.8	2.0
Africa	1.5	1.6	1.5	2.0	2.5
Asia	3.0	10.4	7.9	11.4	13.2

Sources: Barry B. Hughes, World Future (Baltimore and London: The Johns Hopkins University Press, 1985), p. 107; United Nations, 1983 Energy Statistics Yearbook, pp. 1-31.

Table 1-4

Most developing countries have placed considerable emphases on industrialization, which is considered the "noble" sector of the economy. Value-added increased faster in the industrial sector than in the agricultural sector. At the same time, the share of the developing countries in world manufacturing value added (MVA) has risen 2.5% from 1960 to 1980. This pace, however, is far behind that of the socialist countries that have attained 10% increase.[10] We must also note that this industrialization has so far taken place among only a few countries; Brazil, Mexico, Argentina, and South Korea share more than 50% of the total share of developing countries. Even in these countries that have seeming success in industrialization, their achievements are now in a critical situation because of foreign debts, international economic recession, and severe dependency in the export markets.

The rise of oil prices produced a serious economic crisis to non-oil-exporting LDCs (Less Developing Countries). In these countries, the overall debt has grown from $97 billion in 1973 to $664 billion in 1983.[11] Until recently, the growth of debt continued to accelerate. In 1973 the balance of trade deficit in these countries was $11 billion. In 1981 it reached $108 billion and in 1983 it was

Table 1-4: Regional Distribution of World Research and Development Budgets, 1980

Region	Total R&D Budget(in $ billions)	Share of World Total (in %)	Number of Scientists, Engineers (in thousands)	Share of World Total (in %)
Developed Countries:	195.2	94	3,337	90
Western Europe	70.7	34	838	22.3
North America	66.5	32.1	676	18.0
Others(including Japan)	25.6	12.3	488	13.1
USSR & Eastern Europe	32.4	15.6	1,375	36.6
Developing Countries	12.5	6	376	10
Africa	.6	.3	15	.4
Asia	7	3.4	237	6.3
Latin America	3.8	1.8	90	2.4
Middle East	1.1	.5	34	.9

Source: UNESCO, Statistical Yearbook (New York: United Nations, 1984).

still $68 billion. Thus it is inevitable that growth in such developing countries has slowed significantly.

Foreign trade may be an instrument to improve the ecological conditions of the Third World. The trade performance of the developing countries has shown signs of improvement since the 1960s. This growth has been accompanied and sustained by continuous liberalization of international trade, including a general reduction of the tariffs protecting the developed countries. These two factors, rapid economic growth and liberalization of trade, have led to an exceptional expansion of international trade. From 1960 to 1975 world exports increased at an annual volume of 7.1%. Exports of developed countries grew at an unprecedented rate (7.5% annually during the same period), and the developing countries' exports also increased rapidly (5.9%). However, the share of the developing countries in the total value of world exports has not significantly improved, except for the increase of the oil-exporting countries. Even their share has fallen continuously from 15% in 1980 to 10% in 1983 (Table 1-5).

Table 1-5

In the case of the developing non-oil-exporting countries, the figures from 1983 brought their share of

Table 1-5: Regional Composition of World Trade, 1963-83

Regions	(% shares in world exports "X" and imports "M"	1963	1973	1979	1980	1981	1982	1984
Industrial Areas:	X	64	68	63	61	61	61.5	62
	M	64.5	69.5	67	66	63	63	63.5
Oil-Exporting Developing Countries:	X	6	7.5	13	15	14	12	10
	M	3	3.5	6	6.5	8	8.5	7.5
Other Developing Countries:	X	14.5	12	12.5	13	13.5	14	14.5
	M	18	14.5	16	16.5	17.5	17.5	17.5
Eastern Trading Area:	X	12	10	9.5	9	9.5	10.5	11
	M	11.5	10	9	8.5	8.5	9	10

Source: General Agreement on Tariff and Trade, International Trade 1983/84 (Geneva, 1984), p. 5.

world exports back to its 1963 level. Some developing countries, such as NICs (Newly Industrializing Countries), which have diversified their economies, have encountered tariff barriers thrown up by developed countries seeking to protect domestic products. This trend is likely to further deteriorate the trade performance of developing countries, since approximately 75% of the exports of developing countries go to developed countries. Furthermore, most of the exports of developing countries have originated in just a few --- the OPEC states, along with the NICs.

Despite adverse terms of trade, developing countries find themselves so reliant on international trade that it is very difficult to extricate themselves from the present trade web. Foreign trade has already played an important part in the development of many developing countries. As a group, developing countries depend on international trade for 39% of their combined GNPs, contrasting with 29% for developed countries.[12] In addition, most of developing countries export primary commodities as a source of foreign exchange earnings. As a result, the economic conditions of developing countries are extremely vulnerable to world recession and to other external conditions that can cause price fluctuations and economic uncertainties.

Formulation of Research Questions

The contemporary developing countries increasingly become populous, but they lack the domestic resources to meet their population pressures. Domestic adjustments to cope with resource scarcities may result from enhancement of the carrying capacity through a coercive reduction of population growth, consumption control, and technological innovations. When a country fails to satisfy domestic resource demands, it must devise new strategies that often extend national boundaries.[13] External expansion can take several forms, including expansion of foreign trade, regional political and economic integration, and colonial acquisition. For developing countries, however, external expansion is not easily attainable because of their poor military and economic capabilities.

Despite this inherent disadvantage, some countries, especially Newly Industrializing Countries (NICs), depend on huge amounts of resources from outside, thereby enhancing the physical well-being of their people. What separates the NICs most starkly from other developing countries is their relatively high level of industrialization and continuing industrial growth. In international political economy, the NICs have emerged as an object of attention primarily due to their domination of the rapidly growing LDC trade in manufactures. Seven countries ---Hong Kong, Taiwan, Singapore, and South Korea, the Asian "Gang of Four", and Brazil, Mexico, and Argentina ---accounted for over 60% of all LDC exports of manufactures by 1975.[14] Thus, the

emergence of the NICs is not only symptomatic of a changing division of labor between North and South, but of a profound differentiation within the developing world as well. This aspect is only one side of the coin. The NICs are large borrowers and major recipients of foreign direct investment. As is sometimes forgotten, they are large importers of capital and intermediate goods, raw materials, and energy. Despite their impressive export performances, the NICs run a large collective deficit on their current account. The dependence of their GNPs on foreign trade is so high that their economies are tied to the turmoil and disturbances originating from international economic conditions. As a result of this ambivalent aspect, the NICs have often been a focus of the theoretical debates among international political economists.[15]

Aside from this debate for the theoretical implications of the NICs, their dispositions to trade expansion, and their trade structures and performances need to be examined further. Foreign trade, especially for the Asian NICs, is an important element for sustaining their overloaded populations. Successful trade normally requires, over time, a balance between imports and exports. In order to import, a country must obtain foreign exchange through its exports. But the Asian NICs are deficient in natural resources for export earnings. In this case, the only viable option is to produce industrial goods for export.

Increasing trade expansion is likely to provide some

important economic benefits, but it makes a country more sensitive and vulnerable to foreign developments that are beyond its own control. The Asian NICs import large quantities of natural resources, and pay for these imports by exporting manufactured goods. Thus, they are doubly vulnerable to supply threats and protectionism of developed countries. These vulnerabilities are beyond a matter of economic concern for the Asian NICs, being a national security concern. If the world trade system were suddenly to disintegrate, they would suffer an economic and demographic catastrophe of great magnitude.

In fact, much scholarly attention has been presented for the Asian NICs in terms of economic considerations. Main focus of attention has lied in the subjects of export promotion, economic growth, and industrial policies. The importance of supply security has been relatively ignored. Although the small states have been remarkable in their export activities, they have also been notable for heavy dependence on foreign natural resources. From an ecological point of view, these countries like Japan may be considered as environmental breakthroughs by which populations could possibly be living beyond the domestic resource base. But, it must be remembered that their success has been attained at the costs of sensitivity and vulnerability problems to the actions of other countries. While Western European countries and Japan have been preoccupied with the issue of supply security in their foreign policy and national

security discussions, the small states have tended to ignore the importance of supply security. This observation brings into question the ecological pressures of the Asian NICs and their implications for the national security of the countries.

Attention to these import-dependent states is particularly conducive to a deeper understanding of some general questions:

1) How can we define the concept of national security? What is the source of threats to security of a nation? Why does the issue of resource management become a national security concern? How do we describe a nation's ecological dimension, and what type of security threats is originated from the dimension?

2) Under what conditions can developing countries seek solutions for resource shortages beyond their national boundaries? How are lateral pressures manifested in small countries? Why are Asian small countries so aggressive in their export expansion? To what extent can foreign trade be a viable option for developing countries to sustain their population pressure? What is a stable pattern of foreign trade structure for resource deficient countries?

3) What are the general conditions for supply security

of a nation in international relations? What type of supply interruptions is likely to import-dependent countries? To what extent is an import-dependent country secure in resource supply? What policies are viable to reduce sensitivity and vulnerability? What lessons can be deduced from the past experiences of import-dependent countries?

This study seeks to answer these questions by looking at South Korea's current situation with respect to natural resources in shortage (mainly food, energy, and other non-renewable resources). South Korea's case offers several attractions for our concern. First, South Korea has more than 40 million people living in an area about the same size of Indiana, giving it one of the highest population densities in the world. Much of the country is mountainous and its resource endowments are negligible when compared with its current level of consumption. Due to its geopolitical position in Northeast Asia, the nation has been treated at various points in history as a pawn of stronger nations. It seems resonable, therefore, to assume that some conditions have forced South Korea to expand its capability to supply natural resources beyond its national boundaries.

Second, since the early 1960s South Korea has vigorously pursued rapid industrialization. As its level of technology has advanced, other kinds and greater quantities of resources have been needed. At the same time, its level of consumption has increased as technology has altered

people's perception of their needs. In order to meet these rising demands, South Korea has to import raw materials and intermediate goods, creating a large gap between domestic supply and total consumption. While its resource dependency has been growing, the international resource market has greatly changed. This change should demand an especially significant adjustments for South Korea. Thus, an examination of South Korea's case provides an opportunity to observe policies of supply security that are applicable to other smaller and developing countries.

Third, South Korea faces a very hostile enemy, namely North Korea. The military threat from North Korea is so acute and constant that the issue of national security penetrates deeply into all social activities and exhausts much of South Korea's available resources. Thus, it is assumed that South Korea's policies are formulated in order to enhance its level of national security. For this reason, the objective of supply security means much more than merely preventing starvation; it becomes a prerequisite for the nation's military security purposes. South Korea's case therefore may stimulate a discussion of the impact of resource dependence on a nation's total security posture.

Research Orientation and Outline

Although this study concentrates on South Korea's case,

the resulting outcome is expected to provide useful information for more general discussions of resource scarcity and its implications for foreign policy and national security. In focusing on South Korea, this study is expected to satisfy two concerns --- practical and theoretical.

Most obvious perhaps is the practical concern. We live in a resource-depleted age of limits, resulting from human populations' tremendous increase in demand for added varieties and quantities of critical resources following the Industrial Revolution. Contemporary countries cannot be sustained solely by the resources existing within their national boundaries. Increasing domestic demands constitute a persistent dilemma for any government.

As a result, securing resource supplies beyond national boundaries is an important goal for policy makers. This is truer for developing countries than for those developed states that have some viable mechanisms for doing so. Developing countries are inherently incapable of external expansion as a result of poor military and political capabilities. Fortunately, the present world provides opportunities for developing countries to depend on outside resources. Foreign trade as a mode of resource flow among nations is a viable instrument for both developed and developing countries. But it also provides an instrument by which certain countries gain more benefits than do others. An examination of South Korea's case will generate a foreign

trade policy guideline for smaller and developing countries.

This study contributes to a substantial understanding of national security. Above all, the source of threat to national security is not as simple as that expounded in the conventional framework in which only military attack from another country is considered a unique threat. Rather, it comprises internal and external sources of threat, especially in the contemporary interdependent world. The problem of resource shortages within national boundaries seriously affects the nation's total security posture. The issues originated from a nation's resource scarcities encompass both internal and external threat elements, involving population size, carrying capacity, foreign resource supply, and development of new resources. It is suggested that the concept of national security should be broadened to comprehend threats from economic and ecological dimensions.

In the following chapters, we will begin with an attempt to devise a conceptual framework in which the relationship between ecological dynamics and national security is generally discussed (Chapter Two). Chapter Three is to delineate the changing pattern of South Korea's ecological conditions. The time period to be covered is divided into four stages. A systematic and concise description is concentrated in the period from 1962 to 1984. During this time period the nation showed a growing trend of

foreign resource supplies. In Chapter Four, the process of South Korea's foreign trade expansion and its foreign trade structure will be examined. The resulting outcomes are implicitly helpful to judge the stability of the nation's current carrying capacity, since foreign trade becomes a main instrument for the nation's ecological survival. Chapter Five and Six are provided to deal with South Korea's problems of foreign resource supplies. An analytical attempt will be made in Chapter Five to assess the criticalness of the nation's resource dependence in selected resource commodities. The vulnerability of a nation's foreign resource supplies must be assessed by a careful analysis of not only supply conditions specified by a particular commodity, but also the nation's capability to cope with likely supply threats. Thus, the purpose of Chapter Six is to assess the nation's posture of supply security in terms of energy resources.

Footnotes

1. The best known example for environmental pessimism is presented with much fanfare by the Club of Rome in 1972 under the title Limits to Growth; the major conclusions of this study are challenged by Hudson Institute analyst Herman Kahn who directed a report called The Next 200 Years (1976). For the historical review of the two competing images, see Barry B. Hughes, World Futures (Baltimore and London: The Johns Hopkins University Press, 1985), pp. 13-25.

2. This principle is called "Von Liebig's law of the minimum" from the ecological point of view. It holds that "the life of an individual or the size of a population is limited by the resource necessary for survival that is in shortest supply". See Dennis Pirages, The New Context for International Relations: Global Ecopolitics (North Scituate, Massachusetts: Duxbury Press, 1978), p. 14.

3. Some scholars have explained the historical roots of European expansions on the basis of ecological factors, such as population growth, technological advances, and insufficient domestic resources. See Immanuel Wallerstein, The Modern World System (New York: Academic Press, 1974), pp. 38-48; Nazli Choucri and Robert North, Nations in Conflict (San Francisco: W. H. Freeman, 1975); Dennis Pirages, ibid., pp. 23-29.

4. It is true that there is no one method of precisely figuring malnutrition statistics. Therefore, attempts to estimate this phenomenon show great difference. For example, one research report claims that the number of malnourished people ranges as high as 1.3 billion people globally, nearly one-third of the total world population (Hopkins, Paarlberg, and Wallerstein; 1980); more common are estimates between 400 million and 500 million people. See Barry B. Hughes, World Futures, op. cit., p. 134; William W. Murdock, The Poverty of Nations (Baltimore and London: The Johns Hopkins University Press, 1980), pp. 97-98.

5. Ruth Leger Sivard, World Military and Social Expenditures 1985 (Washington, D.C.: World Priorities, 1985), p. 27.

6. During the first Development Decade (1961-1970) the agricultural production of the Third World (excluding China) increased at an annual rate of 2.9 percent. For the second Decade (1971-1980), the United Nations set a target of 4 percent growth in agricultural production, even though no such target had been set for the first Decade. The rate achieved, however, was approximately 2.8 percent. Jacques Loup, Can the Third World Survive? (Baltimore and London: The Johns Hopkins University Press, 1980), pp. 12-13.

7. Jacques Loup, ibid., p. 76.

8. See John Sewell and the Staff of the Oversean Development Council, The United States and World Development: Agenda 1980 (New York: Praeger, 1980), p. 48. In the same year, Exxon Corporation estimated the world energy consumption toward the end of this century. This project shows that while Western European countries will decline in their percentage distribution of global energy consumption, the shares of centrally planned economies and developing countries will continue to rise. Exxon Corporation, World Energy Outlook (New York: Exxon Corp., 1980), p. 9.

9. Barry B. Hughes, World Futures, op. cit., pp. 151-152.

10. In 1960, the share of the developing countries in world MVA was 8.2 %, 14.0 % for centrally planned economies, and 77.8 % for developed market economies. But the 1980s figures were 10.9 % for developing countries, 23.8 % for centrally planned economies, and 65.3 % for developed market economies. See Jacques Loup, Can the Third World Survive?, op. cit., p. 14.

11. The World Bank, The World Bank Annual Report 1983 (Washington D. C.: The International Bank for Reconstruction and Development, 1983), pp. 78-79.

12. Mark J. Gasiorowski, "The Structure of Third World Economic Interdependence", International Organization, Vol. 39, No. 2 (Spring 1985), pp. 337-339.

13. Nazli Choucri and Robert North have used the term "lateral pressure" to refer to the process of external expansion that resulted from a nation's domestic resource scarcities. See Nations in Conflict (San Francisco: W.H. Freeman, 1975), p. 16.

14. Donald Keesing, "World Output and Trade in Manufactures: Structural Trends and Developing Country Exports", World Bank Staff Working Paper, No. 316 (January 1979).

15. From the political economic point of view, the position of the NICs is described as "outward-oriented" or "export-led" development strategies. This strategy is to integrate the developing countries into the world economy on the basis of dynamic comparative advantage. This position is criticized by many scholars. Back in the 1950s, Gunnar Myrdal (1957) and Raul Prebisch (1959) were particularly pessimistic in this respect. Even in 1961 Nurkse wrote that "the world's industrial centers in the mid-twentieth century are not exporting their own rate of growth to the

primary-producing countries through a corresponding expansion of demand for primary product". A more systematic criticism is presented by proponents of a world-systems perspective that describes the position of the NICs as a semi-periphery (Wallerstein, 1973).

CHAPTER TWO

ECOLOGICAL BASIS OF NATIONAL SECURITY

The main aim of this study is to explore the ecological dynamics of developing countries, and their impact on national security. A case analysis of South Korea will serve as a major vehicle for accomplishing this aim. In order to examine South Korea's case, it is necessary to present the conceptual framework within which the relationship between ecological dynamics and national security is spelled out.[1]

This chapter begins with an attempt to redefine the term "national security". Such a begining is quite necessary, because the definition of national security is not yet provided in a clear term, and also because a reconceptualization is needed to include or perceive new sources of threats. After this, we will address why and how ecological dimension becomes a source of national security threat. Main thesis is that certain development of ecological dimension not only introduces a new source of threat to national security, but also becomes a deteriorating factor for the stable maintenance of national security values.

Redefining National Security

The precise definition, scope, and the level of analysis of national security has not been agreed upon yet in the field of national security affairs, and scholarly debates on the topic continue. Lack of agreement on the nature of phenomenon under investigation adds more complexity to an already ambiguous and complex subject; it is one of the reasons why national security theory is less advanced and less coherent than other areas of the theory of international relations. For all this ambiguity, however, a dominant approach can be easily identified by a review of the related literature. In many cases "defense affairs" are used as a synonym for national security affairs. This approach normally covers questions of military, intelligence, and arms-control policy and institutions. In other words, this approach which originated from the western tradition has strived to define national security exclusively in terms of the physical protection of nation-state from external military threats. It places the military dimension of national security at the top of the hierarchy of national core values. A representative case of this reasoning can be observed in the following:

> The concept of security refers to the capability of a state to prevent others from physically harming it, either by invading it or by raining destruction upon it. Security is the protection of the homeland from military attack. The provision for physical security does not exhaust all the goals any state seeks, but it is the prerequisite for the attainment of all the

rest." (Art, 1982: 14-15).

This approach, based on Western tradition, has had a powerful and pervasive effect on threat assessment and policy guidance for national security affairs in developing countries as well. Most developing countries lack a systematic understanding of national security formulations. They face shortages of qualified manpower and lack essential security infrastructures. Under these circumstances, the dominant approach has provided a set of policy guidelines with developing countries. It has created new institutional structures resembling those of the Western world and new strategic and tactical planning groups which outpace other public policy concerns (Kolodziej and Harkavy, 1982; Azar and Moon, 1984: 104-108).

In dealing with the subject of national security, this study casts a critical position to this dominant approach. A primary assumption of this study is that defining national security merely in military terms may convey a profoundly false and damaging image of reality. Above all, it caused states to concentrate on military threats and to ignore other and perhaps even more harmful dangers, thereby reducing security capability after all. In addition, it contributes to a pervasive militarization of international relations that in the long run can only increase global insecurity.

This is not to argue that the dominant approach conveys a profoundly false and damaging image of reality at all times. It has to some extent contributed to the reduction of such overt conflicts as world war among major powers. However, it is evident that the mere imitation of military-strategic approach by developing countries has had no significant contribution in their security environment. There has been a sign of the tremendous expansion of the military establishment in the developing countries.[2] The desire for advanced military systems has not resulted in conflict reduction. Most wars now take place on the territories of the Third World countries. There is an ample evidence that civil wars are on the increase around the world, occurring not only with greater frequency but also with greater severity (Small and Singer, 1979: 101-102; Blackburn et al., 1981: 371; Azar and Eckhardt, 1978: 203-239).[3]

In more specific terms, the overwhelmingly military approach to national security is so narrow that it may overshadow other important aspects of national security. The dominant approach has primarily focused its attention on the military threat as a core factor for a nation's survival, thereby drawing attention away from the non-military threats that promise to undermine the stability of many nation (Brown, 1977: 5; Ullman, 1983: 129). This narrow understanding is not quite promising to have a good grip on the conditions of national security. A military

attack is simply one of the possible threats challenging a nation's survival.

Nowadays, new threats comming mainly from the ecological and economic dynamics are also dangerous to every state. The oil supply interruptions, and economic chaos are casting serious threats to national security concerns. The sudden loss of Persian Gulf oil for even a few days could stagger the world's economy. Global food insecurity and the associated instability in food prices have become a source of political instability especially in developing countries. The centuries-old dynasty in Ethiopia came to an end in 1974 not because a foreign power invaded and prevailed but because ecological deterioration precipitated a food crisis and famine (Brown, 1977: 7). Mass starvation in India, Bangladesh, and many African countries are good evidence of the deterioration of national security value.

Another problem is that military power is questionable to be an usable and effective instrument for attaining a nation's security. In other words, military power is not an reliable option to guarantee stable resource acquisitions and economic well-being. While overwhelming military strength can provide security against an open armed attack by a weak nation, it does not eliminate the possibility that political extremists, incensed by the magnitude of international injustices, could cause discomfort for the major power by a variety of forms of sabotage, terrorism, kidnapping, and blackmail.

In the military security dimension, military strength is not the only effective way of improving security environment. For example, the prosperity and strength of the democratic alliance has been central to the postwar balance of power. But today this balance could be upset by the stress and strain that energy security problems pose to western prosperity and the solidarity of the U.S. alliances. The vulnerable and volatile Middle East is outside the scope of the U.S. formal alliance framework. Moreover, coordination of domestic economic and energy policies among democracies with different interests is bound to be particularly difficult.[4]

This brief examination of the dominant approach of national security studies suggests a new conceptualization of the term "national security". Any attempt to redefine it should not be going such far as to eliminate the importance of military dimension completely. While it is the case that the end of the Cold War has lessened the likelihood of military attack in the western world, it might be more accurate to state that security concerns have not waned but have changed to include economic and other threats. Thus, a new attempt will inevitably involve a broader scope than perceived by the dominant approach.[5]

A new perspective is expected to comprise the following components. First, the source of threat to national security is not as simple as that expounded in the conventional framework in which only military attack from

another country is considered a unique threat. Rather, it comprises internal and external sources of threat. As far as external threat is concerned, the milieu as a threat source is conceived as a multidimensional system including physical or non-physical components. Thus military attack from other countries, global resource scarcity, and supply route blockades are all clear-cut threats to national security, especially in the contemporary interdependent world. In the case of internal sources of threat, a nation is not always a coherent entity. The nation as a political entity bears an incessant process of integrating its people. Government, of course, performs this function. But the relationship between people and government is not necessarily stable. The consequences of this instability are manifested in such disruptive cases as civil wars, revolutions, secessionist movements, and even mass starvation. These incidents should be considered threats to national security as well.

Second, national security as a motive and function for governmental action extends far beyond simply coping with threats to people's physical security (Smoke, 1975: 248-249). The state as a conglomerate of population requires certain basic needs, such as physical resources, security, and political sovereignty necessary for survival. The function of government is to protect these needs in such a way as to enhance them as much as possible. It is expected that any government would go far beyond the mere

practice of military defense in order to provide its people with such needs.

This is empirically the case when we look at the actual practices of governments in international relations. Numerous nations that possess a complex web of national interests often justify their actions in terms of protecting their national security. For instance, the two superpowers often justify their war involvements in remote areas on the basis of security. And past geopolitical theorists tried to justify their expansionist policies in terms of survival. Proponents of trade protectionism posit their rationale on the basis of preservation of national security. Thus the function of national security is much broader than simple physical defense, extending to cover other dimensions including ecological, economic, and political values.

The last point in our new attempt is much more crucial. There is a complex causal link among different threat types. To follow the logic of the dominant approach, the hierarchy of vital national values is fixed in the sense that military strategic value outpaces other potentially vital values. With the presence of multiple threats, however, such a hierarchy is dissolved. It should be noted that vital national values can often be incompatible, necessitating trade-off decisions of the "gun or butter" and "better red than dead" variety. Not all political leaders rank all values equally. Therefore, the proper identification of a crucial threat becomes an important policy task. Such a

choice is largely a function of the individual nation's threat assessment, situational or contextual to each.

Furthermore, the diverse threat dimensions do not merely coexist as separable entities, but are closely interlinked in terms of spill-over and/or backwash effects. For example, a sharp decrease in external earnings for a nation creates short-term or medium-term uncertainties about its military strength through diminished allocation of resources for the military sector. It may trigger socio-political instabilities that provide momentum for neighboring adversaries to instigate aggressive behavior. Or it may push national leaders to external conflictive behavior in order to appease or divert domestic instabilities.[6]

Influenced by these implications, our definition of national security refers to a protective condition in which the various components of national core values are preserved from external and/or internal threats (Cohen and Tuttle, 1972: 1-8; Murdock, 1977: 67-72; Knorr and Trager, 1977: 8; Huddle, 1976; Azar and Moon, 1984: 108-109). What is regarded as core value is a matter of subjective image depending on a nation's goal setting. Implicit in this conceptualization is that the operational definition of security for a particular nation is highly situational, and its content varies over time. This perspective is expected to fit especially for developing countries where the threats from non-military dimensions are real, but are not

adequately recognized yet.

Ecological Dimension as a Source of National Security Threat

The implication of ecological factors for the security of a nation is an age-old focus of attention that goes back to the ancient era. For example, Aristotle realized that such ecological factors as population, territory, and natural endowment are the significant components in building a viable state. In analyzing these components in the light of security concern, he laid a great emphasis on the optimum standard of population and territory to delineate what it is that makes a state great or small. For Aristotle, the greatness of a state is not judged by the size of the two components in numerical terms, but by the capacity of performing the basic functions that are required for achieving a life of self-sufficiency. In this sense he was the first to realize the importance of ecological principles in formulating the attributes of a viable state.[7]

We can identify the same vein of thought in the writings of Jean Bodin and Montesquieu. They maintained that climatic and geographical conditions are key indicators in explaining the political and security diversities of nations.[8] A more coherent argument was provided by Thomas Robert Malthus about the impact of population upon resources, including the availability of food supplies. He hypothesized that population growth will always outpace the

increase in food supplies. If unchecked, population will rise in geometrical progression, although the means of subsistence will be augmented only in arithmetical progression. His central theme laid a great emphasis on the notion that population pressure is a central factor for the dilemma of limits to growth.[9]

It was at the turn of the twentieth century that a de facto systematic understanding of this field took shape in international political studies. For example, the theoretical framework of Arnold Toynbee bears the impact of external threats on national security in a more refined manner. In his "challenge-response cycle" to analyze the rise and decline of civilizations, challenging stimuli including physical or non-physical types do not necessarily lead to serious threats to a civilization. In some cases these stimuli may positively affect the growth of a civilization by contributing to the development of a certain vitality necessary for building that civilization. But he fundamentally admitted that overly severe physical challenges coming mainly from ecological conditions can arrest a civilization's development. For example, the Polynesian, Eskimo, Nomad, Spartan, and Osmanli civilizations were restrained as a result of physical challenges which they could not meet.[10]

Perhaps the most ambitious theorizing of relating ecological factors with politics and security implications can be found in the tradition of geopolitical thinking which

was born of European political geographers. Most of their writings address geography as the provider of advantages or disadvantages in strategic location and resource endowments of central importance for national objectives (Bobrow and Kudrle, 1985: 2-5) They expressed the need for great states to enlarge their boundaries to obtain self-sufficiency in vital resources, and to achieve population growth. Extensive geographical space and national power were synonymous.[11] Thus it is said that the main purpose of national security is to achieve a certain space for the quality of a nation's living condition, thereby legitimizing the nation's right of territorial expansion.

This tradition has been resurrected through various modifications and clarifications. It was the Sprouts who introduced the ecological framework to clarify and systematize the study of man-milieu relationships. Although the old wisdom has enriched our understanding of the international system, the most serious defect has been the almost universal failure of past attempts to anticipate and allow for the rate of technological and other changes. This defect needs to be adjusted in a more coherent way.

The Sprouts criticized the previous theoreticians on the grounds that they were deterministic and unidimensional in formulating man-milieu hypotheses. As a consequence, they emphasized the influence of physical features on political behavior, disregarding the reverse theme and the non-physical dimensions of milieu. Observing these

shortcomings, the Sprouts introduced the "ecological perspective," which is expected to provide a more integrated, holistic view of man-milieu relationships.[12]

This framework has contributed to the development of environmental theories of politics in a new face. The rise of the ecological approach in international relations studies has called our attention to the impact of physical environment on nations' behavior. As Pirages notes, "it offers a mode of explanation which gives theoretical priority to physical realities, and also recognizes tremendous variations in social responses to the same environmental pressures" (1983: 244). Thus, it is suggested to focus on the dynamics of ecological dimension in understanding a nation's foreign policy behavior.[13] In the modern context, the growing resource scarcity and its implications for the survival of a nation has been a main theme of some historical studies. For example, McNeil (1979) and Hughes (1975) applied this theme to the analysis of the decay of many ancient civilization.[14]

At the same time, population, as well as resource and technology factors, the so-called global issues of the present era, have contributed to a burgeoning literature focused upon the implications of population growth and technological advance for resource scarcity (Meadows et al., 1972; Forrester, 1971; Brown, 1977; Pirages and Erlich, 1974); the implications of resource scarcity for potential conflict (Choucri and North, 1975; Ashley, 1981; Soroos,

1984; Arad, 1979; Ullman, 1983; Ophuls, 1984). Technology has made possible the exploitation of resources in inhospitable environments, such as the seabed. At the same time, technology has created the great need for resources that has contributed to their depletion and raised the specter of resource scarcity. The political significance of geographical location has been influenced decisively by technology and by resource issues. In short, a new set of geopolitical or geostrategic relationships has come into existence largely as a result of the pervasive impact of technology on international relations generally and, specifically, on the foreign policies of states.

The study of ecological dimension profits from an understanding of at least three important concepts (Pirages, 1983: 244-247). The first concept is human population and its related growth dynamics. In ecological terms, human populations are subject to ecological and biological imperatives similar to those governing other species. These include a tendency to grow in numbers and demands until the limits of the relevant vital resources are reached, or even exceeded as in Malthusian dramas. When food and other necessary resources are abundant, human populations tend to expand to utilize them.

It should be recognized that there is a hypothetical figure for the optimal number of populations within national territory. In ecological terms, the concept of carrying capacity has developed in connection with the study and

description of the growth and dynamics of natural populations. The term is generally understood to imply the population limit of a species in a given ecosystem or regional habitat. More specifically, the maximum size of a population that can be sustained at a given time and under a given set of environmental conditions is referred to as the carrying capacity of the environment for that organism (Ehrlich and Holdren, 1973: 6-7).

Despite this conceptual definition, the operational meaning is not yet clear. Capacity may be defined in different ways, and it may change with time. An important factor to note in assessing a carrying capacity for a population within a nation is that the population is subject to changes in the environment. The constrained population reacts to these changes and make adjustments in order to survive. For these reasons, carrying capacity must be considered in a dynamic or complex context. Dennis Pirages has refined this concept as follows:

> Each national unit has a natural carrying capacity that limits the biomass that can survive within the constraints of solar energy. Current carrying capacity denotes the biomass that can be supported by present-day technologies combined with a reasonable degree of autarky in natural resources. The number of human beings that can be sustained at present within the limits of current carrying capacity is a function of their basic physical needs; their perceived wants,which result from existing systems of stratification; and competition for scarce resources with other species on the same territory (Pirages, 1978:14-19).

Therefore, a formulation of the carrying capacity should take into account existing levels of technological sophistication as well as the position of a country in the world trade system. In other words, carrying capacity can be defined as the number of population that can be supported by national territorial units given existing levels of technology, a reasonable degree of autarky (self-sufficiency) in essential natural resources, and a reasonably balanced trade profile. Thus, it may be possible for countries to live beyond both their natural and current carrying capacity. The availability of resources has no definable limit, since exploration and new technologies enable any country to find substitutions as the more accessible resources are depleted. But, it should be emphasized that if large quantities of natural resources must be imported, this dependency can be a source of threats to national security.

Global population growth had begun to accelerate by the eighteenth century, and acceleration since then has been quite steady. Colonizations beginning about 1600, and the industrial and transportation revolutions of the eighteenth and nineteenth centuries, accelerated the overall growth rate. The medical and agricultural revolutions of the nineteenth and twentieth centuries dramatically reduced death rates and supported much more rapid growth rates.

Annual global population growth has currently leveled off at 1.8 percent.[15] This pressure in turn has revived the issue of access to natural resources beyond a nation's territory as a vital interest to all nations.

Natural resources are the second important concept in building a link between human populations and ecosystems. From an ecological perspective, a resource is "anything needed by an organism, population or ecosystem which, by its increasing availability up to an optimal or sufficient level, allows an increasing rate of energy conversion" (Watt, 1973: 20). Translating this into political terms, human populations have consumption potentials that are limited by the resource necessary for economic growth that is in shortest supply. Human populations have experienced tremendous increases in demand for added varieties and quantities of critical resources as a result of the industrial revolution. But most of the contemporary countries cannot now be sustained solely by the resources existing within national boundaries. As a result of this, increasing domestic demands constitute a persistent dilemma for any government (Choucri and North, 1975: 15; Sprout and Sprout, 1968: 661).[16]

The way of classifying the natural resources vital for human survival is not always clear. One way is to distinguish between primary, secondary, and tertiary resources. Primary resources like atmosphere, land, and oceans produce the secondary resource (mineral, vegetables,

and animals), and these in turn have been processed by humans into various tertiary resources, which have then been used to produce other manufactured goods (Pearson and Rochester, 1984: 475-476). But a more common classification is to distinguish all natural resources into renewable and non-renewable resources. The former includes raw materials like copper, zinc, and nickel as well as such energy resources as oil and natural gas, all of which are in finite supply and are capable of being exhausted. Resources that are renewable, such as air and water, are threatened not so much by exhaustion but by pollution and spoilage.[17]

Although these two ways are useful in their own terms, perhaps a more useful and convenient way especially for empirical research may be to distinguish all natural resources in functional types appropriate for human purposes. For instance, Paul and Anne Ehrlich have categorized six types of resources essential to the survival of human populations. These include energy, nonrenewable resources, water, food, space, and heat (1972: 59). Among them, three types such as food, energy, and non-fuel minerals are most critical in the current international politics, in the sense that they can be exchangable among nations.

The third concept is technology, which has altered dramatically the relationships of human populations with those of other species and with supporting ecosystems. Technological innovations have created both new demands for

a wider variety of natural resources and increased efficiency of natural resource utilization. Simultaneously, technology has modified human relationships with the environment by creating by-products that can destroy important links in life-sustaining ecosystems. In most cases, economic growth based on technological development has entailed increasing accumulations of residue, many of which cause damage to human and non-human populations, and present continuing hazards of future damage (Sprout and Sprout, 1978: 24-25). In addition, technology has enhanced national capabilities and has shaped the present international hierarchy. On a global scale, however, the side-effects of industrial growth, such as acid rain and increased build-up of carbon dioxide, are dramatically altering the relationships of human populations with each other as well as with the ecosphere (Pirages, 1983: 246-247).

Based on these three concepts (population, resources, and technology), we can formulate the ecological dimension of national security. In other words, the security of a nation-state is also related to an organic dependence of its national population to its physical environment, in addition to the physical protection of a nation state from external military threats. This concern stems from the realization that the national population constitutes the main component of the nation state, and it is an organic unit that cannot survive without a proper resource space for population

expansion and consumption. In this sense, national security involves the continual ability of a nation to keep pace with its rising domestic economic and resource demands either through external expansion of its resource space or by domestic adjustment (Huddle, 1976: 20; Azar and Moon, 1984: 110; Goldstein, 1981: 1-15; Brown, 1977: 5-6).

A threat to national survival emanating from the ecological dimension can be identifiable by examining the relationship between the availability of natural resources and population dynamics, with the consideration of technology as an intervening variable. In other words, an analysis of vital resources within a given territorial boundaries can reveal the overall gravity and direction of the ecological security concerns of a given country. If a country experiences severe shortages of vital resources within its resources space, the country will be sensitive to the issue of access to natural resources for its survival.

In more specific terms, the security concerns of ecological dimension arise from two major areas: domestic failure to cope with increasing resource demands, and a tendancy to cope with resource demands by going beyond national boundaries. Domestic failure becomes evident in cases where national governments cannot meet resource demands internally, especially under circumstances of overpopulations. Many countries mainly from the Third World have gone through severe experiences of food shortages. A lack of arable land, technology, and purchasing power,

coupled with global food insecurity, caused severe security crises in the area.

In the absence of domestic alternatives, countries seek solutions beyond their national territories. There are many options to relieve domestic resource shortages: increase in foreign trade, regional political and economic integration, or military expansion in a fashion resembling the Colonial era (Choucri and North, 1975: 16-19; Pirages, 1978: 26). In this case, what constitutes security concerns is the fear of a supply threat involving access to various essential material goods for which a state is dependent on external resources. The question often posed is how vulnerable a particular states would be if there were an embargo or boycott.

Although this type of security concern is inherent to all countries in the contemporary world, certain countries manifest it to a greater degree. Most West European nations and Japan are easily cited as an example. Almost all tropical agricultural products as well as a considerable share of the minerals required for industry have to be imported. Neither the European Community nor Japan produces more than 25 percent of any of the minerals that are vital for their economies, and even the United States produces less than 50 percent (Loup, 1983: 52-53). Thus, the stability of the western alliance system has often been dangered by the stress and strain that domestic resource policies within the alliance with different interests is

bound to pose. Europeans and Japanese, for example, might respond positively to Soviet offers to guarantee energy supplies, even though we would argue that such steps would legitimize Soviet influence over these regions' economic lifeline. Western policy toward Israel shows a similar tendancy to reflect different degrees of economic exposure to Arab wrath.

The most serious problem arising from resource dependence is attributable to some developing countries. Asian NICs (Newly Industrializing Countries) --- South Korea, Taiwan, Singapore --- are good cases in point. In many respects, these countries are very similar to Japan, depending on foreign countries for large quantities of vital resources to sustain their growing demands from populations. While West European countries and Japan have various options to secure resource supplies, these small and weak countries are severely deficient in this regard. A stable performance of foreign trade is only a viable option to these countries. For this reason, the maintenance of a stable trade pattern becomes an important policy objective for their national security. Thus, an examination of one of these small states will provide some general thoughts of the way of supply security performance in interdependent world, and its implications for other developing countries.

Preconditions for Foreign Resource Acquisition

A nation short of domestic resource endowments for economic growth would try to insure foreign provision by some combination of political, military, and economic means. Nazli Choucri and Robert North have developed the concept of "lateral pressure" to refer to a nation's motivation toward outward expansion arising from domestic resource shortages. They argued that lateral pressure can be expressed by any nation, once it has resource scarcity problems.[18] As Dennis Pirages identified, there can be three general forms of lateral pressures --- expansion of trade, formation of common markets, and colonial expansion (1978: 26). The specific type of means a nation undertakes to insure foreign supplies is determined by domestic economic and military capabilities, technological development, geographic location, and the power, friendliness, and resources of neighboring states (Pirages, 1978: 26; Choucri and North, 1975: 15; Hawly, 1965: 39). But, we may identify the dominant mode of resource acquisition among nations at any given time. In the nineteenth and early twentieth centuries, for instance, the way of resource acquisition was the territorial occupation based on military expansion. Majority of the Third World countries were occupied by a few major states --- European countries, the United States, and Japan.[19] Militarily weak states were treated as objects of expansion by the powerful state. In East Asia, Japan colonized Korea, Taiwan and Manchuria for the supplies of food and other industrial resources.

It is evident, however, that this type of process in the present world is not observable. This means that the mode of resource acquisition has been changed to other viable options, since colonial rule based on military power has not been a particularly effective means for resource augmentation (Bobrow and Kudrle, 1985: 10-13). The mode of resource flow in the current international environment has now become dominated by such activities as international trade, foreign investment, military alliances, and so forth. The international environment of the post-1945 has been qualitatively different from the previous world.[20] The emergence of the United States as the hegemonic power was a great factor in shaping a new international environment. Like Britain in the nineteenth century, the United States hoped to create an international economy which would guarantee its economic and security interests. American economic interests on the whole lay with free trade and free investment. As the world's leading industrial power, the United States had no need for an exclusive imperial system. (Gilpin, 1977: 54-56; Gardner, 1966: 17).

The changed international environment which was shaped by the hegemonic role of the United States enabled resource deficient states like Asian NICs to gain access to foreign natural resources. As self-reliant development strategy was either impossible or appallingly costly to achieve, the basic policy question for Taiwan, Singapore, and South Korea was how to attract the necessary foreign supplies on the

most advantageous terms. Depending on the United States in security support, these states could also gain capital, technology, markets, and raw materials (Bobrow and Kudrle, 1986: 24-29).

This favorable external condition was a necessary, but not sufficient condition for the Asian NICs to expand their trade as a way of enhancing their carrying capacity. Obtaining resource supplies beyond national territories requires some degree of capability. Without certain capabilities such as military, political, or other contrived tools to influence suppliers, a nation's possibilities for resource supplies would be limited. In the changed international environment, access to foreign natural resources has been attainable chiefly by economic capabilities. In order to import, a country must obtain foreign exchange through its exports. Some developing countries could take advantage of their abundant natural resources for foreign exchange earnings. But, the Asian NICs were far from this advantage. These countries, righter after the Second World War, faced the problems of a relatively small territory, very poor in raw materials, and terribly overcrowded. Indeed, these small states were worse off than Japan in most respects. They were also more backward at the end of the war and more eager to bring about economic development. In this situation, they naturally tended to rely on export-led development strategy, both because they had nothing else to offer and because this

strategy seemed to work for Japan. But they went much further in that direction and launched a new wave of export-led development. In order to finance increasing imports of natural resources, they have had to export industrial goods.

The adoption of export-led development strategy by the Asian NICs was also motivated by its linkage effects on military power build-up. South Korea and Taiwan faced the military threats from Communist governments. They were clearly militarily inferior to the Communist forces on the Asian mainland. This fear led the two states to pursue a tight national security posture. In this security posture, an immediate policy objective came into focus on the development of a military industrial capability sufficient to produce endogenous weapon systems. To satisfy this military security objective, South Korea and Taiwan had to pursue rapid industrialization based on export promotion. The importance of export expansion has been highly emphasized for supporting their natural resource imports and military defense capability.

Interdependence and Supply Security

A nation's economy which has heavy dependence on foreign trade entails a new security agenda, representing sensitivity and vulnerability problems. In the absence of a higher authority to coordinate foreign trade, many types of

trade conflicts can be likely. For developing countries with strong trade dependence, this problem has a great impact on their national security postures. Therefore, to avoid and reduce negative consequences at a sustainable level, certain policy options should be developed.

The present international relations can be best described by the term "interdependence". This term is a much-used concept that has different meanings for different people.[21] Borrowing Pirages' definition, "it describes a situation in which two actors become mutually dependent. In the case of nation-states, it means that national populations become closely linked through international transactions" (1978: 37). The energy shock of 1973, probably more than any other single episode, popularized the notion that the world had become highly interdependent. There was a good deal of hard evidence to back up this general feeling. Despite the attempts by some national governments to set up barriers to international flows of goods, people, and ideas, modern communications and travel technology has made borders extremely permeable. The economic fortunes of many countries are at present inextricably interrelated or interwined. Although one can debate the exact definition of the term and the extent to which interdependence has actually increased, it is fair to say that the intensity of the present interdependence is stronger than any other period. This means that if all transactions among countries were suddenly to cease, many

countries would face resource shortages, since the current industrialization is based on finite energy-related technologies.

However, it should be emphasized that international transactions are still merely a tiny fraction of all human interactions in relative terms. For instance, it is less clear that transactions among nations have been rising faster than transaction within nations.[22] Then, too, the growth of international transactions is only one aspect of the interdependence phenomenon. Increasing human interconnectedness across national boundaries may or may not affect other more important aspect of interdependence --- the mutual sensitivity and vulnerability nation-states and national governments experience with regard to each other's actions. The fact is that interdependence is a very uneven phenomenon, both in terms of patterns of interconnectedness and patterns of sensitivity and vulnerability.

Regarding interconnectedness, it is clear that resources do not flow evenly around the world. The bulk of world trade, for example, occurs between developed capitalist countries, with considerable trade also occurring between the latter and the less developed countries and between developed Communist countries. In 1980, 71 percent of the exports of developed capitalist countries went to other developed capitalist countries, with only 23 percent going to less developed countries and 5 percent to the developed Communist states. Less developed countries

participate in the international trade arena primarily through interactions with the developed capitalist countries, rather than with fellow less developed countries or with the developed Communist states (Jacobson, 1979: 56). Not only are interconnectedness patterns uneven in the contemporary international system, but so also are sensitivity and vulnerability patterns. Joseph Nye and Robert Keohane have introduced the terms "sensitivity" and "vulnerability", and made a distinction between the two terms:

> In terms of the costs of dependence, sensitivity means liability to costly effects imposed from outside before policies are altered to try to change the situation. Vulnerability can be defined as an actor's liability to suffer costs imposed by external events even after policies have been altered. Since it is usually difficult to change policies quickly, immediate effects of external changes generally reflect sensitivity dependence. Vulnerability dependence can be measured only by the costliness of making effective adjustments to a changed environment over a period of time (1977: 13).

Certainly, on some dimensions of interdependence (e.g., pollution and climatic change), it would seem every country has a mutual stake in the matter. However, on other dimensions (e.g., vital natural resources), some countries are less sensitive and vulnerable to external actions than are other countries.

The oil embargo of 1973 and subsequent price high

showed very clearly that all countries were not mutually interdependent with regard to petroleum. The Arab states along with the Soviet Union were wholly self-sufficient in energy, and the United States was moderately self-sufficient; Western Europe, Japan and NICs were heavily dependent at the time on Middle East oil. The energy situation made the United States sensitive to the use of the oil weapon but not nearly as vulnerable as its allies.

But one important question should be answered here. Will the challenge of interdependence prove to be the end of the liberal economic order as nations seek to defend themselves from economic shocks, or will the principle of open markets be a sufficient incentive for constructive coordination of policies despite extraordinary economy shocks? In policy terms, this question involves a nation's policy alternatives: 1) to accept the loss of domestic autonomy in return for economic benefit; 2) to use political control for reducing costly damages; 3) to seek joint remedies to the problems of interdependence.[23]

The present trend shows that most countries become responsive to the problems of interdependence, struggling of limiting risks from it. The United States is on the verge of protectionism in international trade. The various European states and Japan are now scrambling to make their own oil deals with producing countries. The developing countries continue to struggle for a new order of international economic system. Economic interdependence

therefore poses a major challenge to the liberal economic order, and also raises important national security issues. Two points regarding economic interdependence deserve comment in relation to national security issue. At one level, it may be a means of leverage against other states. In other words, economic interdependence provides a foreign policy instrument, which could serve as alternatives to the threat or use of force. On the other hand, it may be a direct threat to national security, sometimes demanding a severe damage more than incurred from military threat. A sudden cut-off of oil would demand a serious disruption for resource dependent economies.

Countries can try to minimize their dependence on other countries by reducing their permeability and erecting various barriers, although dissociation from interdependence can be extremely difficult and costly. Among the countries that have felt especially penetrated and have made special efforts in recent years to lessen this condition are Albania, Burma, Somalia, Tanzania, North Korea, and even Nordic countries.[24] Even though they are still far from a complete self-reliance, threats from economic interdependence may be minimal for these countries.

Our concern of national security from economic interdependence is most attributed to those countries which follow the virtues of free trade and industrialization, but are severely deficient in natural resources. Examples are European countries, Japan, and Asian NICs. But it should be

noted that not all these countries face the same degree of security threat. For example, if we use the indicator of the ratio of exports or imports to gross national product, Japan' share is only 12 percent, admittedly more than the 7 percent in the vast United States, but much less than about 20 percent in Germany, 40 percent in Holland, or 50 percent in Belgium. But there is a big difference in the nature of this dependence.

Most of the trade by these other countries is with closer neighbors, often people living on different sides of a border that has become largely meaningless economically. Equally important, the trade is frequently in goods that are similar, selling one another steel, or automobiles, or food stuffs that are only slightly different or somewhat cheaper. Much of this could cease without causing serious hardship. In Japan, what trade there is remains vital. Its dependence on imports for crude oil is 100 percent, for industrial inputs like coal and iron 79 percent and 99 percent, for agricultural raw materials like wool and cotton 100 percent, and for foodstuffs like wheat, maize, and soybeans from 93 to 100 percent (MITI, 1981). Without them industry would collapse and the population would struggle with starvation.

In addition, Japan's trade is vulnerable, since the protection of all sea lanes for its trade activities is beyond the nation's capacity. Apart from the question of safety on the high seas, the possibility of a closure of important passageways such as the Straits of Hormuz and the

Malacca Straits is a constant cause of concern. It would be impossible for Japan to protect these inherent problems by itself (Akao, 1983: 18-19; Bobrow and Chan, 1986: 35-36). Therefore, Japan's position in economic interdependence is more vulnerable than that of European countries.

The Asian NICs are no less than Japan in this consideration. Ecological conditions, such as population densities and resource scarcities are severer than Japan, creating significant foreign resource dependence. Strategic location, especially in the case of South Korea and Taiwan, is more vulnerable than Japan. Over the last three decades, the two small states ran a trade deficit, while Japan finally managed to show surpluses in the mid-1960s. Korea, Taiwan, Singapore and Hong Kong have usually shown deficits until present. And all four have balance of payments problems.[25]

The degree of security position in economic interdependence varies with the strategic conditions a nation faces. Another factor affecting security condition of a nation is the capability of domestic coping mechanisms. A domestic coping mechanism refers to the context of the national security policy of a given country, and comprises the decision context, the distribution of political authority over the pertinent security issues, regime type, and the relationship between states and society. In our concern for resource supply, the ability of domestic coping mechanisms to deal with threats arising from vulnerable

conditions determines the level of supply security of a nation (Murdock, 1977: 72-73; Bobrow and Stocker, 1984: 76-81; Azar and Moon, 1984: 120; Knorr and Trager, 1977: 5-14).

Implicit in this discussion is that any consideration of supply security in an interdependent economy will have two principal aspects: the varying economic condition of nations and the variable ability of nations to cope or respond to external threats. Obviously, the size and diversity of a nation's economy is a principal determinant; other things being equal, a country that has few natural resources will be more vulnerable than one that has many. But, of great significance is the varying ability of domestic coping mechanisms to create or allocate economic resources, shift patterns of economic activity, and the like.

Here, we need to identify the likely threats in resource supply for resource dependent countries. Nobutoshi Akao, a member of the Japanese Ministry of Foreign Affairs, provides the types of supply threat for Japan (1983: 17-20). They can be summarized as follows:

1) Unpredictable supply or production cutbacks; These may be caused by damage to transport or production facilities as a result of regional wars, political instability, accidents or strikes. This type of problem is usually temporary, and can be met by stockpiling, as well as

by diversifying supply sources.

2) Deliberate supply or production cuts; Producers can use raw materials as a political weapon (e.g., the OAPEC oil embargo in 1973 and the US grain embargo in 1980). They can control exports so as to protect domestic consumers (e.g., the US soybean embargo in 1973). Or they can reduce production of non-renewable resources in order to conserve them or to raise prices. Similarly, a national policy, such as the Carter administration's nuclear fuel policy and the Canadian government's suspension of uranium shipments throughout 1977 can have a serious impact on resource dependent countries.

3) Depletion of resources; This threat comes from a serious supply-demand discrepancy of oil and resources, with consequences more serious than any other. This type of threat dictates a country beyond its carrying capacity to develop alternative resource.

4) Sharp price rises; The impact of a sharp price rise in imported raw materials will result in a much higher level of domestic prices and a high current account deficit, thereby dislocating the economic structure.

5) Sabotage of the sea lanes; The current exchange of resources among nations occurs by sea transport. For

example, most Northeast Asian countries have long sea-lanes for their trades. For these states, sabotage of Malacca and Hormuz would be a direct threat to national security.

These types can be attributed to other resource deficient countries in general. However, the evaluation of a nation's security position in resource supplies must involve an examination of the nation's supply conditions and adjustment capability. By reflecting various threats, it is possible to devise an analytical framework that can measure a nation's resource dependence. Such a framework can include many variables which represent necessary conditions of dependence. The variables involve self-sufficiency, concentration and reliability of import suppliers, global availability, substitutability, and so forth. The resulting outcomes will provide useful informations for understanding a nation's characteristics of dependence in the various types of resources.

The response of a domestic coping mechanism will be at international, governmental and private level. It is expected that there are international policy coordination, cooperation between the government and the private sectors, and understanding on the part of the state. In discussing policy options to increase supply security, Albert O. Hirschman's study on the economic instruments for resource supply and influence is useful in many respects, since military instrument may not be particularly effective means

in the current international relations. This is true for such a small state as Asian NICs on which this study concentrates. This may be also true for such a great or superpower as European countries, Japan, and the United States. For such states military option is not totally impossible, but it may be more costly than economic option.

The economic means that Hirschman identified from the practice of Germany in 1930s involves trading relations asymmetrically favorable to the importing nation. For supply, Hirschman points out the importance of controlling ocean trade routes, accumulating stockpiles, trading with countries least likely to be cut off, and concentrating imports on goods needed for war preparedness. For influence, he points out steps to create exporter reluctance to hamper the flow of resources: adjustment difficulties, dependence on importer's goods, and vested interests in continuing resource exports to importer (Hirschman, 1969: 34-35).[26]

Hirschman's main point was to reveal how such a major or great state like Germany before the Second World War could build an advantageous relationship over small states by trade. By concentrating on smaller and weaker states, major powers can deter supply interruption. Implicit in this argument is that it will be an elementary defensive principle of the smaller trading countries not to have too large a share of their trade with any single great trading country (Hirschman, 1969: 31).

After reviewing Hirschman's idea and refining it to a more comprehensive form applicable to the current international environment, Bobrow and Kudrle suggest some policies especially for such major economic powers as Japan: 1) reliance on superpower in military terms; 2) resource suppliers friendly to importer; 3) diversification of resource supply; 4) Stockpiles; 5) technological adjustment to reduce foreign resources; 6) pursuit of a more active intermediary role in world resource trade rather than that of comprehensive spheres of influence; 7) multilateral and global approach for supply security (Bobrow and Kudrle, 1985: 11-13).

They also apply these expectations to the study of the Japanese practice of resource supply. It shows that the Japanese practice with respect to energy supply has been successful, providing tangible evidence of the viability of the strategies suggested above. But, it is interesting to raise a question as to what extent these strategies fit for such a small state like Asian NICs with significant resource dependence. It is assumed that for supply security there will be no significant difference in policy techniques between Japan and Asian NICs. The difference, if any, will lie in the last three items (technological adjustment, intermediary role in world resource markets, and multilateral approach for supply security). For example, the small states are assumed to depend on a bilateral approach rather than a multilateral one, because of their

ambiguous position between North and South. Although they have continued to identify themselves as a developing countries, their dependence on developed countries for export markets, natural resources, and technology has been growing. In this case, a multilateral approach is neither feasible nor desirable for the two small states. Rather, they are expected to embark bilateral bargaining strategies to secure their resource supplies.

A more serious challenge to these states is in the growing difficulty to earn foreign exchanges. Without a successful performance in export activities, the possibility of enhancing their supply security position will be seriously restricted. In other words, a surplus in foreign exchanges can be used as an instrument to secure their resource supply conditions. Japan has already attained this better position, but the small states are still far from it.

The major concern of this study is to devise a general framework to measure a nation's performance of supply security. The examination of non-military approach suggests some general criteria, such as stockpiling, developing alternative resources, technological adjustment, increasing self-sufficiency, securing supply routes, and the like. A nation is considered as secure, if it has substantial achievements in these criteria. In other words, it is assumed that the varing ability of nations to cope with supply interruptions is an ultimate determinant for supply security.

Footnotes

1. Our definition of the term "conceptual framework" is similar to the North and willard's one. They conceive of this term as including a wide range of explanatory positions, and substituting description where rigorous explanation remains to be developed. In other words, a conceptual framework, they say, "is more specific, internally consistent, and integrated than an approach but more tentative than, and lacking the consensual support of, a paradigm." Robert C. North, and Matthew Willard, "The Convergence Effect: Challenge to Parsimony", International Organization. Vol. 37, No. 2 (Spring 1983), pp. 341-342.

2. One study shows that during the 1969-78 period, the military expenditures of developed countries increased from $320.4 to $344.7 billion, an increase of 7.5 percent, while expenditures of developing countries jumped from $63 to $102 billion, or 61.9 percent. The study also notes that there have been intense attempts to acquire military weapons and arms production facilities among developing countries. See Abdul-Monem M. Al-Mashat, National Security in the Third World (Boulder and London: Westview Press, 1985), pp. 3-9.

3. One study found 522 internal wars between 1946 and 1970, with a general increase in the frequency of such wars after 1962 (Blackburn et al., 1981). Another study, while finding the incidence of civil war remaining fairly constant between 1816 and 1977, notes increasing severity over time (Small and Singer, 1979). In addition, there has been an increasing tendency over time for civil wars to become internationalized, especially in the period since 1945 (Kende, 1971; 5-22: Small and Singer, 1979; 100).

4. For the problem of oil supply and its impact on the alliance cohesion between the United States and its Western allies, see Frans R. Bax, "Energy Security in the 1980s: The Response of US Allies", in Donald J. Goldstein, (ed.), Energy and National Security (Washington D.C.: National Defense University Press, 1981), pp. 23-55; Joseph S. Nye, "Energy and Security", in Charles W. Kegley and Eugene R. Wittkopf, (eds.), The Global Agenda (New York: Random House, 1984), pp. 327-338).

5. The emergence of this school of thought in which national security issue includes nonstrategic dimensions is well-known in such writings: (Brown, 1977; Knorr and Trager, 1977; Al-mashat, 1985; Murdock, 1977; Buzan, 1983; Ullman, 1983; Nye, 1982; Taylor, 1976). But, this attempt does not necessarily confine to schloarly community. For example, former Prime Ministry Ohira of Japan, who introduced the concept of "comprehensive security" into official circles,

remarked that "Japan's security has to be comprehensive --- we can only maintain security effectively when not only military power but also political power, dynamic economic strength, creative culture and thorough-going diplomacy are well combined" (Akao, 1983; 10). In United States, a same example is seen in McNamara's statement; "Security means development. Security is not military hardware, though it may include it. Security is not traditional military activity, though it may encompass it. Without development, there can be no security" (McNamara, 1968; 149).

6. Perhaps, this understanding is well-known in the name of "linkage". The origin of this concept goes back to Sprout and Sprout. They introduced the term "the ecological perspective", which envisages internal politics as a system of relationships among interdependent, earth-related communities. One of the principles from this idea deserves our attention; "Any substantial change in one sector of an ecosystem is nearly certain to produce significant, often unsettling, sometimes severely disruptive, consequences in other sectors" (Sprout and Sprout, 1971; 13-31).

7. Aristotle argued further that the careful consideration of these factors enables the defense of the state to be properly planned, and ensures the proper relation of the central city to the surrounding country for economic as well as for military purposes. Ernest Barker, The Politics of Aristotle (London: Oxford University Press, 1978), pp. 289-311.

8. Jean Bodin considered climatic circumstances as the determinants of national characteristics and the foreign policies of states. Jean Bodin, Six Books of the Commonwealth, trans. E. J. Tooley (New York: Macmillan, 1955), pp. 145-157. Bearing Britain in mind, Montesquieu argued that islands could preserve their freedom more easily than continental countries because they are isolated from foreign influences. He pointed to various climatic factors that he felt influenced the political divisions of Western Europe, in contrast to the great plains of Asia and Eastern Europe, and contributed to a spirit of political independence. Baron de Montesquieu, The Spirit of Laws (Worcester, MA: Isaiah Thomas, 1802), pp. 154-159. 259-174.

9. In economic terms, this idea is expressed in the concept of diminishing returns. The concept correctly suggests that the relationship between the size of a country's population and its property resources is highly relevant in determining both its total output and its output per person or standard of living. Malthus's explicit purpose was to account for much of that poverty and misery observable among the lower classes of every nation. see Campbell R. McConnell, Economics (New York: McGraw-Hill Book Company, 1975),pp. 395-396.

10. Toynbee's challenge-response hypothesis can be examined in the following two writings. A Study of History, abridgement of volumes I through IV by D.C. Somervell (London: Oxford University Press, 1956), pp. 60-139: Andrew M. Scott, "Challenge and Response: A Tool for the Analysis of International Affairs", Review of Politics, XVIII (1956), pp. 207-226.

11. It was Rudolf Kjellen who first used the term "geopolitics" to describe the geopolitics bases of national power. Adhering to an organic theory of the state, he held that states, like animals in Darwinian theory, engage in a relentless struggle for survival. This idea was introduced to the German expansionism by Haushofer. see James E. Dougherty and Robert L. Pfaltzgraff, Jr., Contending Theories of International Relations (New York: Harper & Row, Publishers, 1981), pp. 66-71.

12. Three points in the framework deserve comments: 1) the milieu encompasses physical and non-physical features; 2) an environed organism is exclusively attributed to human groups (an individual or a population) rather than to an abstraction such as a state; 3) the complexity of man-milieu relationships transcends simple determinism. See Harold and Margaret Sprout, The Ecological Perspective on Human Affairs with Special Reference to International Politics (Princeton: Princeton University Press, 1965), pp. 9-21.

13. The definition of "ecology" is well expressed by Thomas C. Emmel. He notes that "ecology is the study of the interrelationships of organisms (including humans) with one another and with their nonliving environments, as well as the study of natural systems built upon these relationships. He further details the identification of this study from other fields, especially economics. The word economics, incidentally has the same root as ecology and originally meant management of the household. Although ecology has generally been considered a subsection of economics (which is concerned with maximizing short-term gains), history has proved again and again that it should be other way around. Thus, a policy suggestion from the ecological perspective lies in the stable maintenance of the interrelationships between humans and their environment. Thomas C. Emmel, Global Perspectives on Ecology (California: Mayfield Publishing Company, 1977), pp. 2-25.

14. J. Donald Hughes suggests three themes to study the relationship of human civilizations to the natural environment: first, the influence of the environment on the development of civilizations; second, human attitudes toward nature; and third, the impact of civilizations upon the natural environment. His study concentrates on the ancient peoples of the Mediterranean Basin, in particular the Greeks

and Romans, the Jews, and the early Christians, with a great attention on the second and third theme suggested above. In particular, the theme of environmental influence on the fall of civilizations has an array of evidences in ancient history. The deforestation of Greece and Lebanon, and the invasion of Rome and Mesopotamian cities by the desert are evidence of human mistreatment of nature, thereby incurring her revenge in the decline and fall of the civilizations (Hughes, 1975; 1-7).

15. Yet the population problem is perceived primarily as one of the Third World. Since the beginning of the industrial era's global population surge, there has been remarkably similar growth in Asia, Africa, and Europe. European population nearly quadrupled in the two-hundred years from 1750 to 1983, while Asian, African, and Soviet populations increased by factors of five. Barry B. Hughes, World Futures: A Critical Analysis of Alternatives (Baltimore and London: The Johns Hopkins University Press, 1985), pp. 58-61.

16. Sprout and Sprout developed the model of "rising demands and insufficient resources" from an examination of Britain's role in international politics. They suggested that certain relatively new dimensions of politics might be endowing this age-old dilemma with fresh salience, not only for Britain but for all, or nearly all, political communities as well. These newer dimensions are mainly manifested by the thrust from below, even from traditionally repressed and inarticulate sectors of the political community. Harold and Margaret Sprout, "The Dilemma of Rising Demands and Insufficient Resources", World Politics, Vol. 20, No. 4 (July 1968), pp. 660-693.

17. Although this distinction is commonly used in the current writings, it is not without an ambiguous point. For instance, water and food can often be considered a renewable resource. In theory there may be no limit to the amount of food that could be produce, but in fact there are very real limits to potential food production, such as the availability of suitable land, a favorable climate, and sufficient water (Ehrlich, Ehrlich, and Holdren, 1973; 69-70).

18. In this sense, this term encompasses some of the propositions about imperialism. They argue further that both pre-capitalist and socialist societies may generate lateral pressure. Nazli Choucri and Robert C. North, Nations in Conflict (San Francisco: W.H. Freeman and Company, 1975), pp. 18-19.

19. European countries, such as Great Britain, the Netherlands, France, Belgium, Portugal, Italy, and Spain, controlled over 700 million people in their colonies. Japan

controlled over 60 million people, and the United States about 15 million. See David Finlay and Thomas Hovet, Jr., 7304: International Relations on the Planet Earth (New York: Harper & Row, 1975), pp. 22-23.

20. Bobrow and Kudrle explain the outlook of this changed environment as follows: 1) the advent of nuclear weapons and its negative impact on use of military power on foreign policy matters; 2) the collapse of colonialism; 3) the substantial change of sphere of influence; 4) the rapid pace of change in civil and dual use technologies; 5) the mutual influence in the flows of resource between major powers and their clients. Davis B. Bobrow and Robert T. Kudrle, "Western Theory and Japanese Practice: A New Geopolitics", Prepared for presentation at the XIIIth world congress of the International Political Science Association, Paris, (15-20 July 1985), pp. 7-8.

21. For some this term bears an ideal model to explain an international system. In other words, this term as a theoretical model denotes a more complex set of relationships between not only national governments but also nonstate actors, involved not only in war and peace issues but in other more narrow issue-areas as well (e.g., Keohane and Nye, 1971: Herz, 1959). For others, this term bears simply an increased tractions among nations (Knorr, 1977: Murdock, 1977).

22. Alex Inkeles argues that even though the number of university students studying abroad has been increasing in recent years by 7 percent per year, 98 percent of the world's total student body remains at home to receive their schooling. Alex Inkeles, "The Emerging Social Structure of the World", World Politics, 27 (July 1975), p. 479.

23. Richard Cooper, after examing the implication of the growing interdependence, concluded that a major issue for this trend was whether nations would respond to the growing interdependence passively, accepting the loss of domestic autonomy suggested by the principles of the liberal order; defensively, by establishing barriers to trade; aggressively, by seeking to control the actions of citizen firms outside the nation's boundaries; or constructively, by seeking joint remedies to the problems of interdependence. Richard N. Cooper, "Economic Interdependence and Foreign Policy in the Seventies", World Politics, 24 (January 1972), pp. 159-181.

24. This development strategy has been called "self-reliance". There is, however, no dominant variant of this position. It may represent the program of "collective self-reliance" adopted by the Group of 77. But, it is unequivocally conceived as the "negation of dependency". That, in turn, is assumed to entail nothing less than the

negation of liberalism in its broad philosophical no less than specifically economic dimensions. Johan Galtung et al., (eds.), Self-Reliance: A Strategy for Development (London: Bogle-L'Ouverture, for the Institute of Development Studies, Geneva, 1980), p. 355: John Gerard Ruggie,(ed.), The Antinomies of Interdependence (New York: Columbia University Press, 1983), pp. 11-15.

25. Korea and Singapore have always been in deficits on balance of current accounts. The situation of Taiwan is not easily known, since internationally reliable sources do not cover the nation's data. But, Taiwan has recently been in a good position in this regard. For the case of the former two countries, see International Monetary Fund, Balance of Payments Statistics, 1985.

26. Hirschman's suggestion is more specific than summarized here. To use his means in general, it is necessary to reduce his whole conditions to a more summarized form. Because his study was to show how Germany used economic instrument toward the Balkans. The reduced form for a more general purpose was introduced by Bobrow and Kudrle's article. Thus, the summary suggested in this study is very close to that of both scholars. see Bobrow and Kudrle, "Western Theory and Japanese Practice: A New Geopolitics", op. cit., pp. 4-5.

CHAPTER THREE

ECOLOGICAL ENVIRONMENT OF KOREA: CHANGING PATTERN OF THE CARRYING CAPACITY

In Chapter Two we have introduced the concept of "carrying capacity" to refer to the maximum human populations that can be supported by any given piece of territory. We have also noted that human species are different from other species in the sense that the former use various kinds of institutions and technologies to increase carrying capacity. In addition, national populations have changed the carrying capacity of their territory by depending on trade and/or territorial expansion. Thus, a nation's carrying capacity at any given time is a function of many factors such as technological sophistication, the size of domestic resource base, trade reliance, and so forth. National security concerns with regard to carrying capacity arise from two major cases: domestic failure to meet population pressure, and heavy dependence on foreign natural resources.

The purpose of this chapter is to delineate the changing pattern of Korea's carrying capacity, focusing especially on South Korea's realities. We begin with an overview of historical developments, but a systematic and concise description is concentrated on the period 1962 to

1984, during which South Korea imported large quantities of natural resources. We shall show what are the attributes of South Korea's current carrying capacity. In other words, our main interest of this chapter is to denote the growing gap between the domestic resource supply and the total consumption of South Korea.

Historical Background

Before its division in 1948, Korean peninsula had long been a nation-state. The area of the whole Korean peninsula is approximately 85,000 sq. miles, slightly larger than that of Minnesota. As a resource base, Korea is endowed with few natural resources. Only one-fifth of Korea can be cultivated, largely because of difficulties imposed by terrain. As for its climatic condition, the mountainous northern interior has bitterly cold winters, the southern coast has mild temperatures with monthly averages above freezing; naturally there are gradations between these two extremes. These climatic differences, especially between north and south, affect crop production and hence population densities.[1]

The population of Korea through its long history as a unified nation was limited only to its domestic resource base within the constraints of current solar energy.[2] No effort to enchance its carrying capacity by trade or technological development was possible. Two factors were

responsible for this reluctance. First, Korea was geographically isolated. The main trade routes followed by the Portuguese and Spanish ships, and later by those of other European powers, ran north from Southeast Asia to Japan and to the Southern ports of China. Few of them had any occasion to travel further northeast, and the occasional European ship that appeared in Korean waters had usually been blown off its course in a storm.[3]

Second and perhaps the most important was the cultural chauvinism and isolationism of the Korean ruling class. It was inconceivable to Korean people that anything of value could be obtained from any foreign country except China, and indeed contacts with other foreign nations were strictly limited by law. Opportunities to benefit from direct contact with Europeans were thus let slip by the Koreans, and the only way in which Western thought and technology could influence the country was an indirect one. Even in such an indirect contact, any Western science and technology could not be formally received, since political elites were dominantly influenced by the Confucian concepts of social organization.[4]

There emerged a Western-style pragmatism among the domestic scholars who contacted with Western ideas in an indirect basis around the eighteen century. Their idea which was called "Silhak", was to emphasize the role of commerce for agricultural development. They were also in favor of improvements in transportation, both on land and by

sea, for the encouragement of trade.[5] However, this intellectual movement was defeated by the governmental control. The government became aware of what it considered to be the menace of Catholicism which had already been spread among peoples. After all, the government controled this movement in such a way as to persecute all Catholics and destroy all related books and documents.

As for the population through this period, some interesting data on the population of Korea was collected. These figures, obviously, should be used with caution, for the data were based on taxation records and it was to the advantage of the tax collector to report a low population. Also, since the figures were based upon the number of taxed families, omitting many who were landless, it has been judged that the census recorded perhaps only half the actual population throughout the peroid. It is expected that the real population remained around the level of 10 millions. The first census figures were for the year 1395, at the start of the Yi dynasty but these are obviously inadequate, since they give the figures of 154,403 families and 345,000 persons. But, larger and perhaps better figures are given for the period starting in 1669, and data by province was recorded from the year of 1807.

Table 3-1

Table 3-1: Population Growth of Korea from 1395 to 1891

Year	Households	Population (in thousands of person)
1395	154,403	345
1639	441,827	1,521
1669	1,313,652	5,018
1693	1,547,234	7,045
1699	1,333,330	5,774
1714	1,504,483	6,662
1729	1,663,245	7,131
1756	1,771,350	7,318
1768	1,679,865	7,006
1789	1,748,563	7,368
1813	1,637,108	7,903
1843	1,582,313	6,703
1867	1,602,659	6,807
1891	1,576,672	6,633

Sources: Monthly Statistics of Korea (Seoul, Korea: Economic Planning Board, 1962), p. 2; The History of Korea (Seoul, Korea: The Committee of Korea's History, 1981), pp. 279-301; Joseph S. Chung, (ed.), Korea: Patterns of Economic Development (Michigan: The Cellar Book Shop, 1966), p. 30.

From these historical materials it is seen that for some centuries the population of Korea was checked by limited resources. This was a period of self-sufficient, agricultural economy. It may be safe to say that no dramatic population growth was made during the period. The level of population fluctuated between 5 million and 7 million. The fluctuation can't be explained in a clear manner. But, numerous historical records tell of draught, famine, and flood, which took their toll of lives. There was little knowledge of medicine to curb the epidemics which swept through the peninsula from time to time. Considering the fact that the Korean was oriented toward the maintenance of the population through a large birth rate, we can imagine how the threats from the climatic condition were fatal to them. For instance, a governmental report said that the fatal drought around the year of 1695 demanded almost 1.5 million lives, no less than 20 % of the population.[6]

In addition to the threats from environment, threats from other countries often demanded fatal effects for Korea's economy, thereby leaving its people remaining at the poor economic condition. For centuries, Korea's geopolitical situation at a convergence point of surrounding powers has invited their constant covetous attention and unceasing outright invasions. Until the recent time, there have been approximately 900 wars throughout Korea's history, and most of them were executed within the territory of

Korea. The consequences of the wars were extremely costly for Korea's economy, devastating the land and destroying lives and property. At times her sovereignty was usurped and her culture plundered by conquering nations. Most of time regardless of war, Korean government had to pay tribute to Chinese governments in return for retaining its sovereignty.[7]

Colonial Period

It was not until the late nineteenth century that Korea could contact with western ideas and technologies to enhance its carrying capacity. This contact was too late, as compared with Japan which began to communicate with western countries in the early eighteenth century. However, any autonomous attempt to develop Korea in modern form was prohibited by the power competition among colonial states. Korean peninsula became a pawn in the struggle for power between other nations and groups of nations. After successive defeats of China and Russia, Japan took a hegemonic control in Korea, aiming at the integration of Korean economy into its own economic purpose. Japan, hungry for natural resources to sustain its growing population and export markets for its manufactured goods, tried to find colonies to deal with its impending problems.[8] Thus Korea and Manchuria were made into colonies under military occupation and political rule to provide food and the

primary inputs of the heavy industry of the period like iron and coal.

Under the Japanese colonialism, the Korean peninsula began to experience the industrialization. The carrying capacity of the domestic resource base was to be enhanced by adopting modern technologies and management techniques. As seen in Table 3-2, the grain production of Korea became to increase, doubling during the three decades. Facing with an acute shortage of rice in Japan, the Colonial government in Korea embarked a thirty-year plan for increasing Korean rice production.[9] The aim to increase rice production in Korea was to meet the rice shortage in Japan, having nothing to do with the interests of the native Koreans.

Table 3-2

In addition, coal and water power were developed as the sources of energy power for burgeoning industrial and mining enterprises. Until that time labor and animal power had been used as a source of power. A special company carried on a survey for oil since 1935, but no discoveries were reported and imports of oil were small.[10] Thus coal and water power were the only power resources for the industrial development. In 1932, a report estimated Korea's coal reserves at 42 million tons.[11] These reserves are not

Table 3-2: Grain Production of Korea (1910-1940)
(bushels in thousand)

Year	Rice	Barley and Wheat	Soybean	Total
1910	45,148	16,897	18,012	80,057
1915	65,725	31,313	25,255	122,293
1920	76,195	48,703	30,214	155,112
1925	75,637	54,288	29,711	159,636
1930	98,206	51,912	28,815	178,933
1935	91,571	64,140	28,549	184,260
1940	109,786	66,630	29,754	206,170

Sources: Economic Development of Korea and Manchuria (Tokyo: The Japan Times Publishing Company, 1923), pp. 72-73; Andrew J. Grajdanzev, Modern Korea (New York: The Day Company, 1944), p. 295; Wontack Hong, Trade Distortions and Employment Growth in Korea (Seoul, Korea: Korea Development Institute, 1979), p. 308.

large, but the annual consumption rate was only two million as of 1936. Coal production increased sharply between 1930 and 1936 as indicated in the following table. Most of Korea's mineral resources were distributed in the northern and east central part of the territory. These regions were destined to become the seat of Korea's heavy industry.

Also, there was a wide range of investigations to develop water power resources.[12] The efforts were of tremendous importance for the future of Korea. Her forest reserves were already rapidly being depleted; her coal reserves were modest; but her water-power resources would permit the development of substantial large-scale industry. Table 3-4 shows that before 1930 there was a very slow development of electric power in general and of water power in particular. The first large development came ostensibly as a result of the need for nitrogen fertilizer. In other words, since nitrogen products were important for war purposes, the Japanese Army was reported to pressure for this development.[13] Despite this rapid development, there was no substantial advantage for Korean people. While in Japan nine tenths of the homes were supplied with electricity, in Korea, in spite of all development, only one eighth of the population enjoyed its benefits.[14]

Table 3-3 & 3-4

Table 3-3: Output of Coal in Korea (in thousand tons)

Year	Output
1910	78
1920	289
1929	938
1930	884
1936	2,282

Source: Andrew J. Grajdanzev, Modern Korea, op. cit., p. 131.

Table 3-4: Development of Electric Power Stations (in 1,000 KW)

	in Operation			under Construction		
	water	coal	total	water	coal	total
1910	---	1.7	1.7	---	---	---
1917	0.1	6.5	6.6	---	---	---
1923	3.5	18.6	22.1	22.6	---	22.6
1929	13.4	34.5	47.9	---	---	---
1931	109.4	53.4	162.8	274.9	0.1	275
1938	722.3	145.8	868.1	798.3	50.2	848.5
1943	---	---	2000*			

* This figure was estimated by Grajdanzev. op. cit., p. 134.

Source: Chosen Keizai Nempo (Korea's Economic Annual) (Tokyo: Kaizosha, 1939), pp. 454.

It was estimated that 200 minerals and ores were found in Korea, of which 137 were being used industrially during the period. Among them, Korean iron ore was of great importance for Japan. Although clear data is not available, it was estimated by experts that production of Korean ore in 1943 reached six million tons, or slightly more than production in Manchuria and six times as large as Japanese production for the same year.[15] Other minerals such as magnesite, barytes, copper, fluorspar, graphite, lead, lithium, mercury, nickel, silver and gold, thungsten, and zinc were also mined. The rapid development of mining can be clearly traced to war needs. The Colonial government secured the Japanese enterprises to control mining industry in Korea. As to the European and American mining enterprises, there were 41 of them in 1910, eleven in 1921, two in 1937 and none in 1941.[16]

As for Korean population, it increased from 13 million in 1910 to 23 million in 1940 --- an increase of about 75 percent in thirty years, or of 1.8-1.9 percent a year --- a high but not exceptionally high increase. The emigration was also notably increased, marking at least ten percent of the whole population as of 1944. More than 1.8 million Koreans were working in Japan, about 1.5 million were settled in Manchuria, 200,000 in the Russian Far East, and about 100,000 in all other countries (mostly in China).[17] The emigration to Japan was contrived by the Japanese

government under the pressure of war and the shortage of manpower. But, the emigration to other regions were mostly spontaneous to look for a better living condition away from the bad economic condition in Korea.

Table 3-5

Foreign trade is an important option to increase a nation's carrying capacity. Under Japanese Colonialism, Korea's trade expanded significantly. The total volume of its trade increased from 73 million yen in 1911 to 2,395 million yen in 1939, or almost thirty-three times. The distribution of the trade shows that trade with all the countries named increased absolutely, but that the share of almost all the countries with the exception of Japan and Manchuria declined. At the later stage Japan's share with Korean trade rose from 67 percent to 81 percent; but together with Manchuria (and for all practical purposes Manchuria became a part of the Japanese Empire) it was 94 percent in 1939. Thus, it is clear that the Japanese monopoly of Korean trade was virtually complete.

Figure 3-1

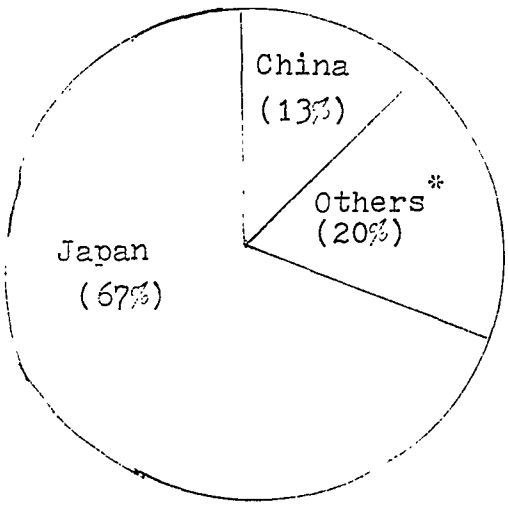
Table 3-5: Population and Estimated GNP (1910-1940)

	Population (1,000 persons)		Density (per sq. mile)	GNP (million of 1970 dollars)	Per Capita GNP (1970 dollars)
	Korean	Japanese			
1910	13,129	172	154	762	57
1915	15,950	304	197	1,365	84
1920	16.916	348	198	1,583	92
1925	18,543	425	218	1,832	97
1930	19,686	502	231	1,777	88
1935	21,249	583	249	3,068	141
1940	22,955	690	269	3,383	143

Source: Wontack Hong, Trade, Distortions and Employment Growth in Korea, op. cit., p. 285.

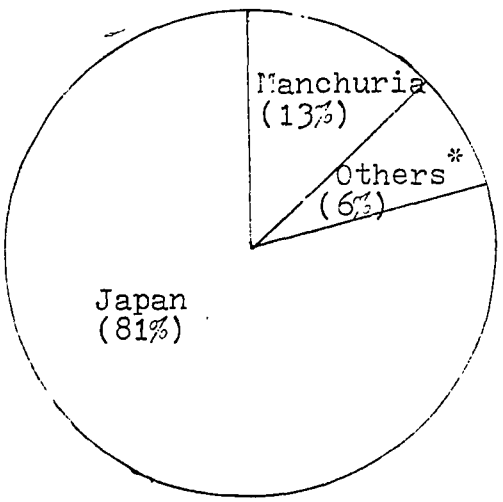
Figure 3-1: Foreign Trade of Korea by Countries (for 1911 and 1939)

1911
(Total Volume of Trade: 72,945 thousand yen)



* Others include Asiatic Russia, Netherland Indies, United States, Great Britain and Germany.

1939
(Total Volume of Trade: 2,395,242 thousand yen)



* Others include mainly China, Asiatic Russia, and United States.

Source: Andrew J. Grajdanzev, Modern Korea, op. cit., p. 227.

If we look at the commodity structure of Korean trade, it is clear that Korea exported mainly food and other raw materials to Japan and imported all kinds of manufactures from Japan. With a gradual expansion of the share of manufactures from less than 5 percent of total exports in the early 1910's to more than 20 percent after 1929, the share of natural resources declined to around the 10 percent level after 1926. But most of the exports of manufactures from Korea included reexports of Japanese-made products, giving no significant benefits to Korea.

The most remarkable fact is that exports of rice (almost entirely to Japan) amounted to about 13 percent of total rice production in Korea during 1915-19, about 22 percent during 1920-24 and about 40 percent of total output during 1925-39. As a result, although the production of rice in Korea increased by more than 100 percent between 1910 and 1940, the per capita domestic consumption of rice decreased. The increased gross domestic demand for grain was satisfied by imports of low grade millet and beans from China. Therefore, one can justifiably conclude that Korea was intended to serve mainly as a colonial supplier of vital resources to Japan.

Table 3-6 & 3-7

Table 3-6: Commodity Composition of Korea's Trade (in percent)

	Imports		Exports	
	Natural Resources	Manufactured Goods	Natural Resources	Manufactured Goods
1910	13	54	82	4
1915	22	66	82	3
1920	27	51	65	10
1925	32	66	70	16
1930	26	65	60	23
1935	20	65	60	22

* Natural resources include foodstuffs, coal, and other non-renewable minerals (e.g. iron ore, gold ore, copper, graphite and lead, etc.).

Source: Wontack Hong, Trade, Distortions and Employment Growth in Korea, op. cit., p. 8-10.

Table 3-7: Per Capita Consumption of Grains (in Bushel/year)

	1915-1919	1930-1933
Rice	3.68	2.33
Millet	1.58	1.69
Barley	2.24	2.14
Beans	0.99	0.74
Others	2.09	1.79
Total	10.59	8.70

Source: Kwan Suk Kim, "An Analysis of Economic Change in Korea", in Andrew C. Nahm, (ed.), Korea Under Japanese Colonial Rule (Western Michigan University, 1973), p. 108.

In other words, although the carrying capacity of Korea's domestic resource base increased significantly, the consumption of the Korean population didn't increase at all because of the exploiting trade of Japan. Rather, as Table 3-7 shows, the per capita consumption of food was not confined to rice alone. The extremely destitute situation of Korean farmers was attested to by many stories. It was told that the Korean peasants were eating the barks and roots of trees in early spring to survive until the season of harvest.[18]

Starting from an almost exclusively agricultural economy, Korea had to supply food and raw materials and provide markets for Japanese manufacturers. One of the important economic benefits to a trading country is the transmission of technology. But the Japanese technology was transmitted to local Koreans only to a limited extent. Japanese wanted to keep good jobs for themselves unless it was absolutely necessary to train more Koreans because of a shortage of technicians caused by the war economy in the late 1930s and the early 1940s. Many Koreans employed in the industrial sector remained as unskilled workers. At the end of 1944, out of the total number of 8,476 engineers and technicians in Korea, only 1,632, or 20 percent, were Koreans. Thus, although the percentage of the total Japanese population in Korea was about 3 percent of Korea's total population, their ratio of engineers and technicians

to the total was 80 percent.[19] When the Japanese left Korea after the end of the Pacific War, most of these modern factories were not able to operate because of the lack of engineers and skilled personnel among Koreans. In short, despite the enhanced carrying capacity of Korea's domestic resource base, the physical well-being of Korean population didn't improve in the same degree.

Division of the Peninsula

Korea regained its independence in 1945, but it was subsequently separated into two states. The ecological characteristics of the Korean peninsula make it an economically interrelated unit with large mineral deposits and hydroelectric facilities in the North complementing the predominantly agricultural economy of the South. The division of the country destroyed this interdependency of the economy. It gave the South less than half the land, about two thirds of the population, most of the agriculture, and very little of the industry.

Table 3-8

As Table 3-8 shows, to a considerable degree the two parts, north and south, were complementary to one another.

Table 3-8: Comparison of South and North Korea at Division (in 1949)

	South Korea	North Korea
Land (square mile)	35,820	49,400
Population (in thousand)	20,167	9,740
Density (per square mile)	563	197
Food Production* (1,000 M.T.)	2,691	---
Iron ore Production (in 1944) (percentage share of total 3,331,814 M.T.)	3.3	96.7

* It includes rice, barley, wheat, and other grains. North Korea's production is unknown. But it is estimated that North Korea was far behind South Korea in grain production.

Sources: Shannon McCune, Korea's Heritage (Rutland, Vermont: Charles E. Tuttle Company, 1956), p. 221 (for iron production), p. 230 (for food production); Korea Statistical Yearbook, 1963, p. 16 (for land and population).

The consumer goods industries of the south depended heavily on the north for electric power and semi-finished raw materials; and the north depended heavily on the southern industries for consumer products. The agricultural production of the south was greatly increased by the utilization of fertilizer, much of which was manufactured in the north. This interdependency was completely cut by the proclamation of the two hostile regimes in the peninsula. Therefore, the two Koreas had to face severe resource shortages as a result of the division of the peninsula.

The economic condition of South Korea was much more aggravated than North Korea. North Korea had almost 90 percent of the whole industrial base, but had relatively small population. In 1953, the year the Korean War ended in a ceasefire, per capita GNP was about $130 in 1970 dollar prices, which was short of the level attained in the later stage of the Colonial era by 20-30 dollars. By contrast, it was revealed that per capita income of North Korea surpassed that of South Korea by double until the early 1960's.[20] The economy in the 1950s possessed all the familiar characteristics of extremely underdeveloped countries.

Until the early 1960's the agricultural and service sectors together still contributed about 85 percent of the GNP. Nearly two-thirds of the working population were engaged in agriculture. Commodity exports remained negligible throughout the period, usually amounting to less than 1 percent of GNP, while commodity imports, which

amounted to more than 10 percent of GNP on the average, were mostly financed by U.S. grants-in aid.[21] Persistently overvalued domestic currency effectively thwarted the export potential of the Korean economy. The industrial policy pursued during this post-war period may be loosely characterized as a policy of import substitution of non-durable consumer and intermediate goods behind a protective wall of tariffs and quotas. However, any kind of whole-hearted and systematic government effort toward rapid economic growth was conspicuously absent.

The situation until the early 1960's was such that South Korea could hardly have been expected to achieve one of the outstanding development records of the first development decade. The country entered the 1960s with one of the lowest income levels in the world; it had little experience participating in international trade; and its potential for rapid economic progress was not evident. The industrial revolution was retarded because of its geophysical features. There was a pausity of mineral resources; although anthracite coal is found in various parts of the country its poor quality limits its use primarily to domestic heating. Despite considerable exploration no petroleum or new sources of mineral deposits had been discovered. The coal consumption to support its negligent industrial sector could not be supplied solely by its domestic resource base; South Korea had to import approximately 20 percent of the total consumption.[22]

The economic condition of South Korea through the 1950's depended mainly on its domestic resource base characterized by agricultural productivity. No significant consumption for fossil fuels was found, except its negligent consumption for the emerging industrial sector. The level of population was much higher compared with its grain production. Thus, its economy had to depend on the American aid to sustain its overloading population to a minimum survival level.

Industrializing Period (1962-1984)

The military coup in 1961 provided a turning point for South Korea(hereafter Korea) in enhancing its carrying capacity by depending on technological innovation and foreign trade. After taking the political power, the military government began systematic efforts to achieve rapid economic growth, and the vigor of its efforts was maintained by the formulation and energetic execution of a series of five-year economic development plans.[23] The main purpose of this plan was to convert completely Korea from agricultural to industrial economy. This ambition was totally against Korea's geophysical outlook, given its poor resource endowment and underdog status in the regional politics.

The Korean War provided a new territorial border to Korea some 2,000 square miles more (total 38,175 square

miles) territory than the 1945 division along the 38th Parallel. But, no significant effect was made for its shortages of natural resources necessary for its industrialization by this territorial change. Within this small territory Korea's population which was already overloaded in any rational measure began to grow further beyond the limit of the domestic resource base.

During the past two decades (1962-1984) the Korean economy has achieved remarkable growth and a significant improvement in the standard of living. At the same time, Korea experienced a rapid structural transformation from a backward rural economy to a semi-industrial state. Korea's outward-looking development policy and promotion of heavy and chemical industries have played an important role in this transformation. This pattern could be achieved by abundant supplies of natural resources at reasonable prices from overseas markets, since Korea is poorly endowed with resources to back up industrialization.

Demand Side

In a rapidly industrializing nation, two factors are responsible for a wide use of natural resources; increasing level of population and technological development. Different from the Agricultural Revolution in which the technological developments were based on the constraints of current solar income, many of the new technologies in the

Industrial Revolution are dependent on finite supplies of fossil fuels. It is assumed that where the structure of economy is being shifted from an agricultural one to an industrial one, there will be increasing demands on natural resources.

Table 3-9 shows the population growth of South Korea and its density from 1962 to 1984. South Korea's total population stood at approximately 4,060 millions, an increase of 14.09 millions or 53 percent of the figure recorded in 1962. This level ranks the 21st largest in the world. The country's population density as of 1984 was 1,064 persons per square mile, the world's 3rd highest, next to Bangladesh and Taiwan.

Table 3-9

The population growth of Korea has steadily declined from an average 2.5 percent in 1960's to the recent average rate of 1.6 percent. The rate dropped further to 1.53 at the time of 1978, but the rate has been slightly up to 1.57 since 1980. According to the 1985's census, there has been no clear sign for a further decline during the five years, 1980-1985. The failure to reduce the growth rate has been due to the fact that children born during the era of the post Korean War baby boom reached the height of their

Table 3-9: Population Growth and Resource Consumption (1962-1984)

	Population			Grain Consumption		Energy Consumption	
	Total (1,000)	Growth Rate(%)	Density (per square mile)	Total (1,000M/T)	Per Capita Consumption (MT/person)	Total (1,000TOE)	Per Capita Consumption (TOE/Person)
1962	26,432	2.95	692	5,732	0.22	10,308	0.39
'63	27,184	2.85	712	6,236	0.23	10,928	0.40
'64	27,958	2.85	732	6,641	0.24	11,377	0.41
'65	28,705	2.67	752	7,349	0.26	12,127	0.42
'66	29,436	2.55	771	7,217	0.25	13,100	0.45
'67	30,131	2.36	789	7,867	0.26	13,895	0.46
'68	30,838	2.35	808	8,527	0.28	15,823	0.51
'69	31,544	2.29	826	9,415	0.30	17,738	0.56
1970	32,241	2.21	845	10,668	0.33	19,679	0.61
'71	32,883	1.99	861	12,069	0.37	20,868	0.64
'72	33,505	1.89	878	12,651	0.38	22,307	0.67
'73	34,103	1.79	893	12,460	0.37	25,627	0.75
'74	34,692	1.73	909	12,443	0.36	26,087	0.75
'75	35,281	1.70	924	13,094	0.37	26,644	0.76
'76	35,849	1.61	939	13,526	0.38	30,306	0.85
'77	36,412	1.57	954	14,265	0.39	34,371	0.94
'78	36,969	1.53	968	15,073	0.41	38,252	0.95
'79	37,534	1.53	983	16,734	0.45	43,463	1.16
1980	38,124	1.57	999	14,775	0.39	44,115	1.16
'81	38,723	1.57	1,014	14,924	0.39	46,052	1.19
'82	39,331	1.57	1,030	15,294	0.39	45,974	1.17
'83	39,951	1.58	1,047	16,951	0.42	49,700	1,24
'84	40,578	1.57	1,063	17,052	0.42	53,896	1.33

Sources: Economic Planning Board, Korea Statistical Yearbook, 1980-1985; The Bank of Korea, Economic Statistics Yearbook, 1965-1975.

child-bearing years during this period.

It is remarkable to see that the birth rate has fallen from 4.3 percent in 1960 to 2.3 percent currently, and that the population growth rate has fallen from 3.0 to 1.6 percent. These figures compare very favorably with those of other developing countries. This relative success is in a large part due to the family planning program which was started in 1961 by the government. This was the first official, explicit, anti-natal policy undertaken by any national government. In 1982, the government took additional measures and set a new "quality of life" goal of zero population growth by 2050. This requires achieving replacement-level fertility by 1988, i.e., an average of 2.1 rather than 2.3 births per family. Even if this is achieved, past growth will raise Korea's population to 50 million by the year 2000 and to 61 million by 2050.[24]

As for the emigration, a total of 477,456 persons has emigrated until the end of 1982 since 1962, when the Emigration Law was enacted. The number includes 378,443 to the United States or almost 80 percent of the total, and others (mainly Canada, Latin American countries).[25] In order to stimulate emigration, the government converted the Overseas Development Corporation from a private to a government invested enterprise in 1977. The recent activities have notably declined as the success of the emigration to areas other than the United States turned out to be questionable. Therefore, the emigration doesn't seem

to be a critical factor in reducing Korea's population pressure.

In relation to resource requirements, the factor of population growth alone does not sufficiently explain Korea's growing demands of natural resources, as seen in Table 3-9. While the nation's population increased 53 percent during the 22 years, the total energy and food grain requirements increased almost 400 and 300 percent respectively. Although the population growth rate has steadily declined, the annual growth rate of energy and food requirements has maintained a figure much higher than the former. As a result, per capita consumption of the resources has steadily increased during the same period. Thus, the Korea's growing demands of natural resources should also be examined by considering another factor, technological advance and its related impacts on growing resource demands.

Our proposition that the growing level of technological advancement is positively correlated to the growing level of natural resource demands may not be correct, since technology can increase efficiency of natural resource utilization. This point may be attributable to highly developed countries. In dealing with a case of newly developing countries like Korea, however, the proposition suggested above is believed to be quite valid, because their technological advance and related economic growth have been attained by resource-intensive industrialization. In other

words, an industrializing society normally experiences a growing demand of natural resources.

Korea has experienced a rapid structural transformation from subsistance agriculture to modern manufacturing economy. In 1962 Korea was one of the poorest developing countries, with heavy dependence on agriculture and a weak balance of payments financed almost entirely by foreign grants. By 1984 it had become a semi-industrial, middle-income nation with an increasingly strong external payments position. The share of primary industries in the total industrial structure decreased from 40.2 percent in 1962 and to 28.3 percent in 1972 and to 14.0 percent in 1983. On the other hand the share of secondary industries increased from 15.2 percent in 1962 to 39.0 percent in 1983. Tertiary industries' share also held its growth, with a share at 47.0 percent in 1983 compared with the 44.6 percent recorded in 1962.

The structural change is reflected in the composition of export commodities. Exports of manufactured goods comprised 22.0 percent of the total in 1961; thereafter, the portion increased substantially to 62.4 percent in 1966, 86 percent in 1971 and 95.3 percent in 1984. Heavy and chemical product exports made rapid strides to occupy a larger and larger share in export composition. By 1984, the share of heavy and chemical product in the nation's total exports increased to 56.8 percent from 17.0 percent in 1970.

Table 3-10

Korea's rapid industrial growth, relying increasingly on the development strategy of export-oriented industrialization, has successfully boosted its economic growth. A quantitative analysis of the sources of Korea's economic growth indicates that during 1962-1984 the GNP growth rate was 10 percent per annum. In the five-year period prior to the launching of the first formal development plan in 1962, the Korean economy grew at an annual rate of approximately 5 percent which is comparable to that of the world economy during the same period. In the 23-year period between 1962 and 1984 the GNP at 1984 prices grew from $12.3 billion to $81.1 billion, an increase of 560 percent. Per capita GNP at 1984 prices rose from $464 to $1,998. This growth was fueled by the rapid expansion of exports, which increased from approximately $50 million to $121.3 billion over the same year.[26]

The rapid economic growth has been accompanied by the growing consumption of natural resources. As we see in Figure 3-2, the Korea's GDP growth rate was positively correlated to its growth rate of energy consumption during the 23 year period. It is notable that the Korea's economic growth was at a low ebb during the first and second oil shock. Unless this close relationship is released, the

Table 3-10: Structural Change of Industrial Sector
(in percent)

	Primary	Secondary	Tertiary
1961	40.2	15.2	44.6
1966	35.4	20.1	44.5
1970	28.4	21.7	49.9
1972	28.3	24.4	47.3
1975	24.9	28.0	47.1
1979	19.2	33.8	47.0
1980	15.9	35.7	48.4
1981	18.3	35.9	45.8
1982	18.1	35.4	46.6
1983	14.0	39.0	47.0
Japan	4.0	42.0	55.0
U.S.	2.0	32.0	66.0

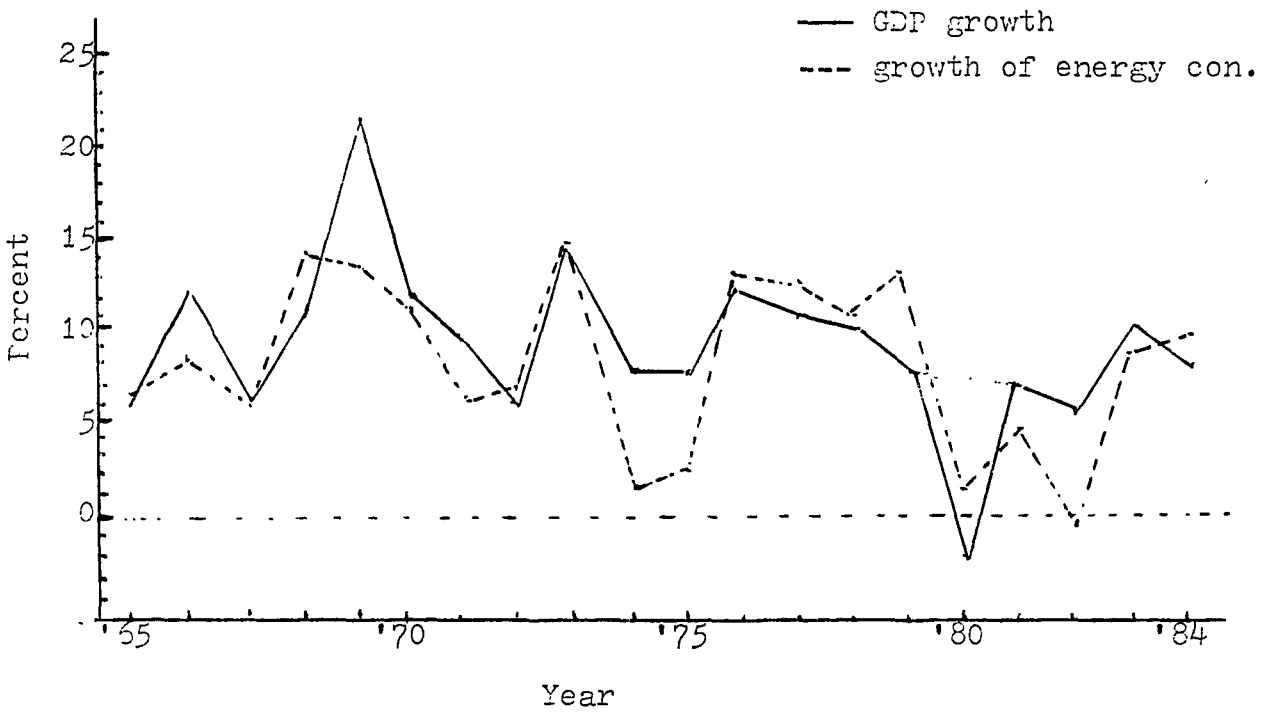
Sources: Bank of Korea, Economic Statistics Yearbook, 1984; For 1983 statistics, United Nations, Statistical Yearbook, 1985.

nation's further growth in economy would naturally demand a growing consumption of energy resources.

Figure 3-2

A further examination of the relationship between economic growth and energy consumption can be available by measuring resource units consumed per unit of GDP. As Table 3-12 indicates, the first oil shock contributed to the decline of the weight until 1975. This achievement resulted from an application of the energy conservation measure. But, the weight began to steadily increase from 1976 when the first oil shock was recovered. The most important factor for this rise was attributed to the nation's industrial deepening. The Korean government became fully conscious of the need to bring about structural changes in exports and industrial output from 1976. As a result, the Korea's industrial structure has been depending on such heavy industry as machinery, ships, chemicals, iron and steel, and automobile, which are energy intensive. After the second oil crisis, the weight shows a declining figure as a result of the nation's extensive effort to reduce energy consumption. However, the Korea's weight in this regard is still much higher that that of developed

Figure 3-2: Growth of GDP and Energy Consumption



Sources: GDP growth; International Monetary Fund, International Financial Statistics, 1985, pp. 394-395: Growth of energy consumption; The Bank of Korea, Economic Statistics Yearbook, 1965-1985.

countries. For example, the Korea's weight (TOE/GDP) in 1982 was 1.38, as compared with 0.50 of Japan, 0.96 of the United States, 0.78 of England, and 0.58 of Italy in the same year.[27]

Table 3-11

In short, the pattern of Korea's development concerning population and industrialization are assumed to demand a large amount of natural resources. There has been no clear sign for post-industrial society yet. The population growth rate stands at the 1.5 level which is a relative success to other underdeveloped countries, but a far distance from the level of developed countries. Thus, population pressure continues to be a critical factor for resource scarcities. Technological advance is also rapidly growing, but the stage that Korea belongs to is still far away from a high-tech stage. Therefore, Korea will be further sensitive to the issue of access to foreign natural resources.

Supply Side

Food: In general, food production that provides calories and protein can be divided into largely three categories: grain, fruits and vegetables, and meat and fish.[28] Although the

Table 3-11: Primary Energy Consumed Per Unit of GDP

Year	Energy Consumption (1,000TOE) (A)	GDP (billions of won; 1980 constant) (B)	A/B
1962	10,308	7,516	1.372
'63	10,928	8,203	1.332
'64	11,377	8,996	1.265
'65	12,127	9,512	1.275
'66	13,100	10,671	1.228
'67	13,895	11,300	1.230
'68	15,823	12,581	1.285
'69	17,738	15,315	1.158
1970	19,679	17,190	1.145
'71	20,868	18,770	1.112
'72	22,307	19,886	1.122
'73	25,627	22,754	1.126
'74	26,087	24,555	1.062
'75	26,644	26,408	1.009
'76	30,306	29,760	1.012
'77	34,371	32,979	1.042
'78	38,252	35,320	1.053
'79	43,463	38,952	1.115
1980	44,115	37,830	1.166
'81	46,052	40,453	1.138
'82	45,974	42,687	1.077
'83	49,700	46,734	1.063
'84	53,896	50,437	1.069

Sources: Based on the same sources of Figure 3-2

dietary pattern of Korean people has changed since its industrialization, the main food consumption still depends on grains like rice, barley, wheat, and corn. Among them rice is the most important source of food for Korean people, because of its long-cherished tradition. As its dietary pattern has changed, more consumption of meat and fish has been shown.

The total food grain production (including rice, barley, wheat, potatoes, corn, and others) showed steady growth through the period of 1962-1984; average annual growth rate of 1.8 percent, which lags behind the average annual growth rate of population by 0.6 percent. But the consumption of food grains increased from 5.7 million tons to 17 million tons during the same period, revealing an average annual growth rate of 5.34 percent. Thus, Korea had to import a large quantity of food grains to sustain the growing level of consumption, thereby creating food grain dependence over the years. As we can see in Figure 3-3, Korea's good grain self-sufficiency has dropped to less than 50 percent. A further drop will be inevitable if we consider Korea's limited productive capacity.

Figure 3-3

The decreasing level of self-sufficiency is not due to

Figure 3-3: Overall Food Grain Supply

Sources: Economic Planning Board, Korea Statistical Yearbook, op. cit., 1969-1984; The Bank of Korea, Economic Statistics Yearbook, 1965-1975.

the shortage of main grains such as rice and barley, but due to the increasing demands for wheat and corn which are negligible in domestic production. In fact, the production of rice and barley are enough to sustain the current level of consumption. In 1984, Korea produced 5.5 million tons of rice which is approximately 80 percent of the total food grain production. Rice has been only the grain that has increased in production during the period. Other grains have decreased or have been constant in production. Even though the production of barley has significantly decreased, the demands for barley has also dropped to the level of 1.3 million tons in 1984 from the highest level of demand reached at 3.5 million tons in the early 1970's. Thus, the domestic production of rice and barley is sufficient to meet population demands.

The major factor for dropping Korea's food grain self-sufficiency is attributed to the increasing import dependence in supplying wheat, corn, and soybean. In 1984, the demands for these grains reached 8 million tons, 90 percent of which was imported. The domestic production of these grains has steadily decreased reflecting the governmental effort in which Korea would become self-sufficient in rice and barley if imports of wheat and feed grains increase. More consumption for these grains is mainly comming from the growing needs toward livestock production. In fact, Korean people tends to consume more meats, while the consumption of grains has recently

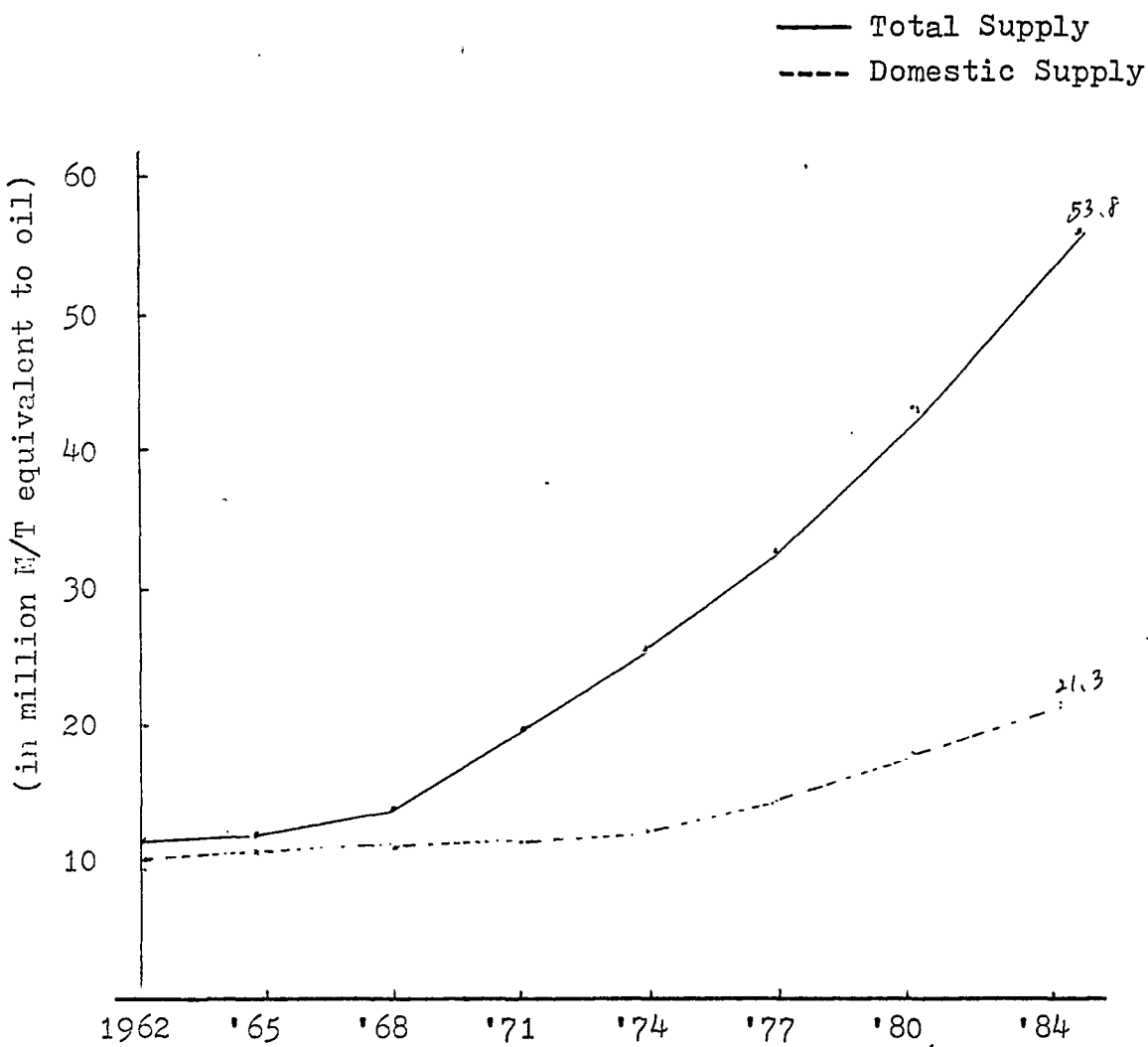
declined. The per capita annual consumption of food grains dropped from 204.4 Kg in 1976 to 184.8 Kg in 1983, whereas the consumption of meats rose from 4.3 to 13.3 Kg in the same years.[29]

In addition, meat supply in 1984 was 564,000 tons, an increase of 6.5 percent over 1983. The sensitive product to foreign supply is beef, and other products like pork and chicken are almost self sufficient. The import of beef fluctuated from 50 thousand tons to 20 thousand tons, reflecting a self sufficiency rate of 50 to 90 percent during the period of 1976-1984. If we consider the changing pattern of Korean people's food consumption, the demands for meat will be increasing, creating more foreign dependence on feed grains and beef supply.

Energy: During 1962-1984 total internal energy consumption in Korea grew at an average rate of 8 percent a year from about 10 million TOE to about 54 million TOE. Per capita consumption over the same period grew from 0.36 TOE to 1.33 TOE. This dramatic increase in energy consumption made the country depend on foreign supply, more than 60 percent of the total consumption as of 1984.

Figure 3-4

Figure 3-4: Trend of Energy Supply



Sources: Economic Planning Board, Korea Statistical Yearbook, 1980; Yonhap News Agency, Korea Annual 1985, pp. 130-131.

The main factor for the growing energy dependence is Korea's complete absence of petroleum reserve. The country has to import 100 percent of crude oil. Demand for petroleum has been rising since 1962, the year when the First Five-Year Plan was evolved. Energy policies which put emphasis on petroleum consumption instead of coal increased the demand for petroleum. Since 1971, it has outgrown the share of anthracite coal in total primary energy resources, exceeding 50 percent. Although the percentage share of petroleum decreased from 61.8 in 1977 to 56.2 in 1984, the amount of imported petroleum has continued to rise, marking 201.3 million barrels or 8 percent increase from the level of 1983.

The energy resources that the domestic resource base can supply are anthracite coal, hydro and nuclear, and firewood charcoal. The production of anthracite coal, the largest energy resource possessed by Korea, continued to rise markedly until 1967 when it reached 12 million tons which were enough to meet coal demand. The output of coal temporarily declined in the late 1960s, mainly due to the government's policy of encouraging oil instead of coal. Coal mining, however, was again activated in the early 1970s, especially since the energy crisis in 1973, maintaining 20 million tons of annual production through 1980's. Since coal demand has also increased, Korea has had to import certain amount of coal, 0.8 million tons or 30

percent of the total consumption in 1984.

In Korea the coal reserves are made up primarily of anthracite coal and some brown coal, in addition to peat. There exists little bituminous coal, one of the most indispensable fuels for modern industry. It is estimated that coal reserves are nearly 1.6 billion tons, of which 635 million tons are expected to be mined with present technology.[30] If 20.1 million tons of coal are mined annually, the amount produced in 1982, the reserves will last for 32 years. An effort to increase the domestic coal production will not be successful in the future, since the conditions of coal mining have already reached the maximum capicity. A governmental report issued in 1985 predicted that Korea's coal production would drop from 1987 by average annual rate of -0.7, reaching 1.8 million tons around the year of 2,000.[31] It will be inevitable for Korea to depend on foreign coals to a greater degree, as the substitution of oil and net energy demands will be expected in the future.

The share of hydro and nuclear power has been relatively small in total energy consumption. The share of hydropower has maintained an average of 1.5 percent. The capacity of electric power generation increased from 175 thousand in 1962 to 700 thousand TOE in 1984. This capacity in the total electric power generation is very small, covering only 5 percent, compared with 55 percent of petroleum, 20 percent of nuclear, and 20 percent of coal based power generation.

It is remarkable to see that the Korean government decided to embark on a nuclear generating program aimed at achieveing more than 50 percent nuclear generation by 1986. As of 1984 Korea had 3 nuclear plants working, and another 6 plants were under construction. The share of nuclear energy in the total energy consumption reached 5 percent in 1984. Most of Korea's power development program involves the substitution of atomic energy for petroleum. Should Korea's atomic power plant projects go on as scheduled, the electric power industry will enter the atomic age in 1990s, holding total 9 or 11 nuclear plants.[32] However, this ambitious program does not mean that Korea will be self-sufficient in energy supply. Although uranium exploration has been going on since 1970, no substantial quantities of radioactive fuel have been discovered. Thus, resource dependence of uranium will be inevitable, accompanying financial burdens on the technological management of the power plants.

It is quite fair to say that Korea's energy dependence will be increasing in the future. The capacity of domestic energy supplies will not meet Korea's mounting energy demands, as its capacity for coal production will decline. Even though the imports of crude oil are reduced, other substituting energy resources like uranium and coal will be increasingly imported, creating a large gap between domestic supply and total energy supply.

Non-fuel Minerals: The major non-fuel minerals that

industrialization has demanded in a rapid fashion are iron, cooper, aluminum, the ferroalloys (chromium, nickel, manganese, cobalt, molybdenum, niobium, and tungsten), the precious metals (silver and gold), and the nonferrous metals (lead, zinc, and tin).[33] According to the results of exploration activities carried out in the recent years, Korea's reserves of metallic mineral products such as silver, lead, zinc and copper ores are estimated to be relatively plentiful.[34] In particular, tungsten ore reserves represent one of the richest sources in the world. The increased demand for mineral products arising chiefly from industrialization and the government's mining promotion measures account for the sharp expansion of mineral production. However, the domestic productions of non-fuel minerals have not met the nation's rapidly growing demands since the late 1970s. Although the reserves of iron and cooper ores are relatively abundant, their qualities and conditions for production are not conducive for more production.

Until the mid-1960s, about 60 percent of total mineral production was taken up by demand at home. However, domestic demand started to rise from the late 1960s, due primarily to expansion and development of refining capacity. A governmental report about the long-term prospect of raw material supply predicted that Korea would have to import all minerals except tungsten beginning in 1985.[35] As of 1984, the minerals that could meet domestic demands are lead

and tungsten. Other principal minerals such as iron, cooper, and zinc were already in a severe dependency. In addition, aluminum, one of the major building block of industrial nations, is in a complete dependency since bauxite which is an aluminum-bearing ore is not produced in the country.

Table 3-12

As the country has industrialized in a rapid fashion, the refined products in copper, lead, zinc, and aluminum has been demanded in a great amount. Since domestic production couldn't meet the level of demands, Korea also had to import such products. A severe dependency in the non-fuel minerals is expected in the future, as the country tries to become a more industrialized society.

In summary, Korea's economic well-being increased dramatically from the position of complete poverty in 1960s to relative affluency in the 1980s. No starvation is reported in this country in the current years. The current per capita income level, 2,000 dollars, is considered a relatively good record as compared with many other developing countries which have to struggle with poverty. Korea is still far behind the level of developed countries which has already outpaced the 10,000 dollars in per capita

Table 3-12: Korea's Supplies of Selected Mineral Resources (thousand M/T)

	Domestic Consumption			Domestic Production			Foreign Dependence(%)		
	1971	1978	1984	1971	1978	1984	1971	1978	1984
Aluminum	0.06	2.0	9.3	0	0	0	100	100	100
Antimony	0	0.2	1.3	0	0	0	[illegible]	100	100
Chromium	0	3.8	5.0	0	0	0	[illegible]	100	100
Titanium	6.8	36.1	44.1	0	0	0	100	100	100
Zircon	0.2	1.0	7.1	0	0	0	100	100	100
Phos Phate	497	654	1652	0	0	0	100	100	100
Kyanite	0	0	0.7	0	0	0	---	---	100
Magnesite	0	0.07	27.0	0	0	0	---	100	100
Sulfur	157	514	568	0	0	0	100	100	100
Manganese	26.3	128	250	2.3	0.7	0.07	91.3	99.5	99.9
Copper	17.6	58.4	349	5.7	2.6	1.9	67.7	95.5	99.5
Tin	0.01	0.7	1.8	0.01	0.03	0.03	0	96.1	98.4
Iron	535	4316	10912	504	693	625	5.8	83.9	94.3
Flurite	58	12	34	57.8	11.3	4.7	0.4	5.9	86.2
Zinc	56.3	163	201	56.3	133	98.5	0	18.5	51.0
Gold(Kg)	896	3730	4416	896	852	2462	0	77.2	44.2
Molybdenum	0.2	0.4	0.5	0.2	0.4	0.3	0	0	37.9
Talc	70.2	203	213	70.1	202	192	0.4	0.1	9.8
Kaoline	198	589	787	191	550	721	3.4	6.5	8.4
Pyrophyllite	142	468	686	142	463	656	0	1.0	4.3
Silver	49	63	118	48	43	116	2.6	30.8	1.7
Silica Stone	162	334	869	161	332	868	0.7	0.6	0.2
Lead	34	32	22	33	32	22	3.0	0	0
Tungsten	3.7	4.8	4.8	3.7	4.8	4.8	0	0	0

Source: Ministry of Energy and Resources, Yearbook of Energy Statistics, 1985, pp. 197-211.

income level.

To sustain the current economic development, Korea has to depend on foreign natural resources in a significant amount. As we already discussed, the nation's current carrying capacity is well beyond its domestic resource base. In this respect, Korea is very close to Japan. But the problem of resource shortages is more critical in Korea which has outpaced Japan in population pressure and growing consumption of natural resources. Although Japan has economic and technological capacity to cope with resource shortages, Korea is still in the stage of resource intensive technologies. Thus, the issue of secure resource supplies from foreign countries becomes a vital interest for Korea.

Footnotes

1. The differences of agricultural production, due to differences of climate and terrain, naturally result in differences in population density. Thus the five political provinces of northern Korea, with an area of 43,631 square miles, had a population of 8,223,477 in 1940, a density of 188.47 persons per square mile, whereas the eight provinces of southern Korea with an area slightly less, 41,654 square miles, had a population almost double that of the north: 16,101,558 and a density of 386.55 persons per square mile.

2. Throughout its long history, the Korean people lived close to their soil. Until the 1950s, the economy of Korea was predominantly agricultural. A typical Korean farmer usually cultivated his small farm averaged from two to four acres. From this amount of land, sometimes with the help of an animal to do the heavy plowing but otherwise dependent on the painstaking efforts of himself and his family, he tried to wrest a living. For the living conditions of the Korean people in history, see Shannon McCune, Korea's Heritage: A Regional and Social Geography (Rutland, Vermont: Charles E. Tuttle Company, 1956), pp. 82-99.

3. Woo-Keun Han, The History of Korea (Honolulu: East-West Center Press, 1970), p. 316.

4. The central feature of the Confucian thought as an idea of social organization can be briefly expressed by the rigidity of mind, resistance to change, refusal to face realities which conflict with the thought. Thus, the political answer of the ruling class to western pressure was attempts to isolate Korea completely from the outside world, refusing all foreign contact and violently repressing all foreign ideas at home.

5. The Silhak scholars demanded an end to empty formalism and concern with ritual trivialities and a return to the true spirit of Confucianism. They also demanded a practical, empirical approach both to government and to learning. The movement has its roots in the 17th century but came to prominence in the 18th. The best known scholars were Yun Chung (1692-1714), Yi Ik (1681-1763), and Chong Yag-yong (1762-1836).

6. The History of Korea (Seoul, Korea: The Committee of Korea's History, 1981), p. 292.

7. For example, the amount that Korean government had to pay as a contribution to Chinese government in 1636 reached 70 percent of the governmental expenditures. This amount had to be paid almost every year. see, ibid., pp. 348-349.
8. Japan was already densely populated, marking about 379

persons in a square mile, which was almost double of Korea's density in 1920's figure. And the population increased 700,000 each year. Therefore, there emerged advocates of Lebensraum in the domestic politics. see Economic Development of Korea and Manchuria (Toykyo: The Japan Times Publishing Company, 1923), p. 43.

9. During the planned years, many works such as extending irrigation, the clearing of new lands, a larger and better application of fertilizers, and better methods of cultivation were performed. By 1933, 118.4 million yen had been spent on work connected with this plan (Hishimoto, 1938; 59).

10. Andrew J. Grajdanzev, Modern Korea (New York: Octagon Books, 1978), p. 131.

11. ibid., pp. 131-133.

12. The first investigation was held by the Colonial government from 1911 to 1914. The conclusion was that the potential capacity was only 57,000 KW. A second investigation conducted between 1922 and 1926 estimated the water power potential to be 2,250,000 KW. see Chosen Keizai Nempo (Korea's Economic Annual), 1939, p. 238.

13. Andrew J. Grajdanzev, Modern Korea, op. cit., p. 135.

14. ibid., p. 139.

15. Chosen Keizai Nempo (Korea's Economic Annual) (Tokyo: Kaizosha, 1939), pp. 454-458.

16. In this way big firms --- branches of Mitsubishi, Sumitomo, etc. --- secured control of the mining industry. With few exceptions, Koreans were employed only as laborers in the mining industry. See Andrew J. Grajdanzev, op. cit., pp. 146-147.

17. Dae Young Kim and John E. Sloboda, "Migration and Korean Development", in Robert Repetto and others, Economic Development, Population Policy, and Demographic Transition in the Republic of Korea (Cambridge, Massachusetts: Harvard University Press, 1981), pp. 37-49.

18. This remark was expressed by the Governor-General Ugaki in 1933. Although this situation was made by Japanese exploiting trade, it is believed that even total grain production would not be enough to sustain the whole Korean population. For the same situation continued even after the independence of Korea.

19. Chul Won Kang, "An Analysis of Japanese Policy and Economic Change in Korea", in Andrew C. Nahm, (ed.) Korea

Under Japanese Colonial Rule (Michigan: Western Michigan University, 1973), p. 84.

20. A study shows that from 1953 to 1962, per capita income of North Korea increased 17.2 percent annually. But, South Korea marked only 0.8 percent annually. Byung Joon Hwang, The Industrial Economy of Korea (Seoul: Korea University Press, 1966), pp. 170-171.

21. The American aid began in 1953, but it was in 1956 that the American aided construction really started. The amount of aid (the total of the PL 480 fund and the AID fund) amounted to 44.3 percent of $273,800,000, the total amount offered to Korea before 1965.

22. Korea's Continuing Development (Seoul, Korea: Ministry of Reconstruction, 1959), p. 69.

23. This plan started from 1962 with the unit of five years. After the assassination of the former President Park in 1979, this plan has continued without any modification in style.

24. For the details about specific measures, Korea Annual (Seoul, Korea: Yonhap News Agency, 1985), pp. 177-179.

25. The figures were calculated from two sources: Ministry of Culture and Information, A Handbook of Korea, 1978, p. 718; Yonhap News Agency, Korea Annual, 1983, p. 178.

26. These figures were calculated from the following source; International Monetary Fund, International Financial Statistics, 1985, pp. 394-395.

27. Ministry of Energy and Resources, The Long-Term Prospect of the Korea's Energy Supply (Seoul, Korea: MER, 1985), p. 189.

28. A more specific categorization may be possible to include all types of food. For instance, world food can be divided into five categories: cereals, legumes, fruits and vegetables, and roots and tubers, and meat and fish. See Dennis Pirages, The New Context for International Relations: Global Ecopolitics (North Scituate, Massachusetts: Duxbury Press, 1978), p. 79.

29. While per capita annual consumption of food grains decreased from 204.4 Kg in 1976 to 184.8 in 1983, the consumption of meats increased from 4.3 to 13.3 Kg during the same period. Per capita annual consumption of fruits and vegetables also increased from 59.1 to 140.8 Kg. Economic Planning Board, Korea Statistical Yearbook, 1984, p. 262.

30. This estimation is based on one of the governmental reports: Ministry of Culture and Information, A Handbook of Korea, 1983, p. 586.

31. The report predicted that while coal production would increase average annual rate of 0.7 percent during 1984-1986, the rate would drop average annual rate of -0.4 percent from the level of 1987 during 1987-1991. The rate would further drop -1.08 percent annually during 1997-2001. Ministry of Energy and Resources, The Long-term Prospect and Strategy for Energy Toward 2000 Years, 1985, p. 205.

32. Ministry of Energy and Resources, op. cit., p. 168.

33. This categorization is based on Dennis C. Pirages's idea (1978; 158-170). Clearly, the kinds of non-fuel minerals are much more than this. For example, Choucri has identified thirty-seven minerals in revealing U.S. dependence. See Nazli Choucri, "Population, Resources, Technology: Political Implications of the Environmental Crisis", International Organization (Spring 1972), p. 31.

34. The Proven reserves of non-fuel minerals in Korea are as follows (in 1000 M/T); Gold (5)/ Silver (12,378)/ Copper (18,468)/ Lead (26,577)/ Zinc (26,577)/ Iron (123,395)/ Tungsten (24,142)/ Molybdenum (61,611)/ Manganese (1,078)/ Tin (191)/ Antimony (24)/ Cobalt (17)/ Nickel (17). See The Federation of Korean Industries, Korean Economic Yearbook, 1984, p. 291.

35. Ministry of Culture and Information, A Handbook of Korea, 1983, p. 541.

CHAPTER FOUR

STRUCTURE AND DYNAMICS OF KOREA'S FOREIGN TRADE

The examination of the changing pattern of Korea's carrying capacity in the previous chapter already indicated that since the early 1960s, access to foreign resources has become a vital interest for the nation's economic and ecological security. The domestic supplies of food, energy, and nonfuel minerals are not sufficient to sustain the current level of consumption. As Korea's economy has a tendency to shift further from agricultural to industrial structure, the nation's dependency on foreign natural resources has been growing.

Another significant implication from the previous chapter is that Korea must be successful in export expansion. Otherwise, there would not be such a wide range of imports in natural resources. As already noted, Korea until the early 1960s throughout its long history had never changed its carrying capacity by depending on foreign trade. Even its available resources within the domestic resource base could not be sufficiently distributed to its people because of its weak position in regional politics. In this sense, the rapid industrializing period from 1962 shows a unique feature in its economic history. Although it is questionable whether its national sovereignty in political,

economic, and other dimensions is kept well, the overall quality of life in physical conditions has improved impressively, showing a remarkable pattern of uninterrupted progress. It is no doubt that this success has been possible by Korea's incessant efforts toward expansion in foreign trade.

In this chapter, we are interested in some aspects on Korea's foreign trade. Although this study focuses on Korea's supply security in natural resources, it is essential to look at the whole picture concerning its foreign trade. Successful trade normally requires some prerequisites to be met --- e.g., a stable profile in balance of payments, available markets, stable resource supplies, and a secure position in bilateral trade. To the extent that these conditions are not available, a nation's importing possibilities are limited. Two specific questions are expected to be answered in this chapter: What factors are responsible for Korea's remarkable trade expansion? And with security concerns in mind, what can be pointed out from Korea's foreign trade structure in light of sensitivity and vulnerability? These two concerns are derived from a generalization that increasing carrying capacity by trade expansion brings an ambivalent effect to a nation state: it creats an opportunity to sustain population pressure for more economic growth, but produces serious vulnerabilities for national security concern.[1]

Background of Korea's Trade Expansion

During the past 23 years since the start of the planned economic development, the volume of Korea's trade has grown rapidly, maintaining approximately 25 percent in average annual growth rate. At the same time, the percentage share of foreign trade to its GNP increased 20 percent in 1962 to 73 percent in 1984. It is no doubt that most of Korea's economic growth in the recent figure has been derived from its trade activities.

Table 4-1

As for Korea's imports, foreign supplies of goods and services consistently exceeded exports after 1962. Since 1962, the share of natural resource imports compared to its total imports has always kept more than 60 percent. The second largest share has been capital goods. The sectoral supplies in natural resources are more dramatic during the period from 1962 to 1984: total demands of food grains from 5,732 to 17,052 thousand M/T; energy from 10,308 to 25,000 thousand TOE; iron ore from 100 to 11,574 thousand M/T. As already indicated in the previous chapter, the Korea's foreign dependence of food, energy, and non-renewable minerals already reached more than 50 percent of Korea's

Table 4-1: Trend of Korea's Foreign Trade Expansion
(in million dollars)

Year	Total Volume of Trade (A)	Imports	Exports	Balance of Trade	GNP(B)	B/A (percent)
1962	427	422	55	-367	2,377	20.1
1967	1,316	996	320	-676	4,274	23.3
1972	4,146	2,522	1,624	-398	10,573	39.2
1977	28,577	18,511	10,046	-3,465	37,429	76.3
1980	39,797	22,292	17,505	-4,787	61,203	65.0
1981	47,385	26,131	21,254	-4,877	67,191	70.5
1982	46,104	24,251	21,853	-2,398	70,797	65.1
1983	50,637	26,192	24,445	-1,747	75,280	67.3
1984	59,876	30,631	29,245	-1,386	81,073	73.4
Annual Average Growth Rate (%)						
'62-'66		22.9	44.3			
'67-'71		22.9	33.8			
'72-'76		22.9	51.0			
'77-'81		22.9	22.3			
'82-'84		5.9	11.9			

Sources: Office of Customs Administration, Statistical Yearbook of Korea's Foreign Trade, 1985; Economic Planning Board, Korean Statistical Yearbook, 1968-1985.

total consumption in each sector, and it will be growing further in the future.

Korea's dramatic increase in foreign resource supplies some questions concerning ecological constraints and national strategies to overcome resource shortages. It has been traditionally considered that access to such vital resources is a function of national power in international relations. Korea's case simply denies this rigid interpretation, and a careful examination of Korea's case can lead to a substantial understanding of the new geopolitical environment and economic development strategy for developing countries. Our discussion focuses on the international and regional political environment, and Korea's development strategy.

International Environment: It is safely assumed that there must be some favorable conditions in international environment for the rapid expansion of foreign trade in a smaller nation like Korea. For Korea, at least two conditions should be met to expand its trade; abundant and stable resource supplies and accessible markets for the export of manufactured goods. These conditions are not easily attainable for weaker states. An examination of the post-war environment and its impacts on Korea may reveal some information necessary to realize the dynamics of Korea's trade expansion.

The resource flow among nations in the post-war

environment was dictated mainly in economic considerations. Righter after their gains of political independence, many resource abundant countries from Asia, Latin America, and Africa found themselves able to sell in largely open international markets and anxious to develop their resources to achieve economic benefits. As Bobrow and Kudrle note, "In the short run, earnings from resource exports could contribute to political stability. In the long run, they might provide the basis for broader economic development".[2] For resource importing countries, mainly from industrialized countries, the method of economic exchanges based on liberal trade was less costly than others which were previously executed in the Colonial period. At the same time, some weaker states which are deficient in natural resources benefited from the post-war international economic order by gaining free access to resource-abundant countries.

The international economic order shaped in the nexus of East-West confrontation was the competitive manifestations of the two different economic thoughts --- the classical liberalism in the West, and the mercantilism in the East. While the economic policies of the Communist countries have been based on autarky (economic self-sufficiency), those of the Western bloc countries have been dictated by laissez-faire economic principles. Having been integrated in the Western bloc from the beginning of its independence, South Korea's resource supplies were greatly enhanced for

sustaining its economic growth.

The character of an international economic order is greatly affected by the distribution of power among nations. It has often been pointed out that the two international economic orders in the post-war environment were the reflection of the hostile confrontation of two superpowers --- the United States and Soviet Union.[3] From this perspective, the international economic organizations like GATT and IMF in the Western bloc were the reflection of a hegemonic power's interest, the United States. There was a hierarchy, with the United States as the dominant political and military power over weakened Europe and Japan. In the Third World, nations in great part remained politically subordinate to the old imperial powers. Thus, as long as the U.S. hegemonic leadership and its basic goal to keep the liberal economic order remained constant, secure access to vital resources could be guaranteed to the constituent countries.

The United States became involved in East Asia as a hegemonic leader immediately following the Second World War. The U.S. interests were hardly limited to economic interests; they also included military strategic interests for its advantage against Communist upsurge. The two small states --- Taiwan and South Korea --- were clearly militarily inferior to the Communist forces in the regional politics. Although the United States proclaimed its strategic interest in Japan, it was not until the outbreak

of the Korean War that the two smaller countries became strategic assets in the American perspective. After 1953 armistice, the U.S.-Korean Mutual Defense Treaty was signed between the two countries in Washington in the same year. Since this treaty, U.S. interest in South Korea's security was viewed as part of its overall strategic purpose of containing any likely attack from Communists. The United States pursued this interest in South Korea by maintaining U.S. troops near the Demilitarized Zone and by providing over $11 billion in aid, almost equally divided between arms and economic assistance during the 1954-73 period.[4]

The U.S. presence in East Asia as a hegemonic leader was accompanied by the complete integration of three constituent countries into the world economy. As in Europe, strategic considerations associated with the Cold War dictated extensive exceptions to the liberal norm. Trade and financial aid links were self-consciously channeled to serve the triple purpose of economic reconstruction, strengthening the internal political position of pro-U.S. political elites, and consolidating strategic relations through economic interdependence. This condition was undeniably favorable for the northeast-Asian countries to develop economic position. Being seriously deficient in natural resources and overpopulated, they needed resources and markets for their manufactured products. The U.S. contributions were substantial to these states by providing supply security and vast markets as well. In other words,

historical timing was an important factor in the success of trade expansion for Asian NICs. Korea, Taiwan, Hong Kong and Singapoer entered the world market during a period of unprecedented trade expansion, rapid liberalization of the American and European markets and a growth of foreign direct investment not only from the United States, but from Japan as well. This favorable condition was employed profitably by the small states.

Development strategy: The military coup in mid-1961 provided a turning point in Korea's overall outlook. The most obvious change in the nation's characteristic is that state function became to work for the integration of national energy with professed national objectives throughout all social sectors. This change was followed by the consolidation of political power against its private sectors. It is one of the embarrassing works in political science to describe this type of political system. It may be effective to borrow the concept of "strong state" in understanding the substantial changes followed by the military involvement in the early 1960s.[5] All existing political, economic, and social organizations were disbanded, and then reorganized under government auspices. The central location of the state power was in the hands of the President Park's direct control, with an substantial aid from the Korean Central Intelligence Agency and the organization of the Presidential Secretariat. The change in

the structure of state power was a strong factor affecting the implementation of the policy objective.

In understanding the national objective chosen urgently by the new political elites, it may be helpful to consider the relationships among three national objectives accepted in a general discussion --- security, autonomy, and prosperity.[6] It is true that the three goals of national defense, economic prosperity, and self-determination can often be incompatible, necessitating trade-off decisions of the "security or prosperity" and "prosperity or autonomy" variety. Not all national leaders rank all goals equally. It is also likely that a nation can achieve substantial degrees of security and autonomy without the use of military forces.[7]

The political leaders of Korea in the early 1960s perceived economic prosperity as a major objective to be obtained from the beginning. It was believed that economic prosperity is essential to attain true security and autonomy. For example, right after his successful military coup on May 16, 1961, General Park said;

> I cannot think of anything else that would make me more miserable than to be hungry. Priority one of my duties at this moment is to drive poverty away from this chronically poor country, and I believe this is the only way to win the struggle against Communism.[8]

This perception was well reflected in the successive policy making processes. The new political leadership has since exerted all available resources, both domestic and foreign, to insure rapid economic growth of the country.

This heavy emphasis on economic growth resulted in bold trade-off decisions to the detriment of defense and autonomy. Two examples can be cited for this case: one decision was to open diplomatic relationships with Japan; another decision was to become involved in the Vietnam war. In 1965, the government began negotiations with Japan on a diplomatic normalization treaty to end the twenty years of noncommunication between the two geographically close neighbors.[9] This bold initiative toward Japan was met by strong opposition from political activists. From the Korean standpoint, there are ample reasons to doubt the motives of the Japanese. Much of suspicion is justifiable when viewed from the perspective of Korea's historical context. The Koreans' cynical feeling toward the Japanese was nurtured by their own experiences during the Colonial period and reinforced by the attitude of the Rhee regime after the liberation. During the period of Rhee's control, the relationship between Korea and Japan had badly deteriorated, causing Rhee to consider Japan as Korea's foremost enemy.[10]

What most people in opposition to this rapproachment between Korea and Japan worried about was that it would

stimulate another Japanese control over Korea, through economic means. Park' regime finally succeeded in keeping the treaty in an official position, with the aid of U.S. support.[11] The government immediately received a large monetary payment from Japan as indemnity for the exploitation of Korea during colonial rule by Japan. The government used these funds as capital investment for financing its economic development projects.[12]

The decision to dispatch Korean troops to South Vietnam in 1965 was a case in which the goal of economic development outpaced the military security issue. Although South Korea was inferior to North Korea in power posture and was in a constant threat from North Korea,[13] the economic returns for this bold action were too tempting to turn down the U.S. proposal. The decision of getting involved in the Vietnam War, ostensibly made to repay the debt incurred to the United States during the Korean War, gained currency for South Korea in the form of payment for services rendered by the South Korean armed personnel in Vietnam and for the purchase of Korean goods and services there.[14] President Park's decision again won the gamble of the Vietnam adventure, as he successfully quieted down domestic opposition through 1972, when South Korean troops were finally withdrawn from Vietnam after the Nixon administration's settlement of the Paris peace talks with North Vietnam. Thus, the Japan-Korea treaty and the commitment of troops to Vietnam were to provide important

new resources to the Park government to implement its professed national objective in urgency.

In pursuing economic development, the new government took a different strategy from the past government. During the post-war reconstruction period, the government emphasized import substitution without giving much attention to the possibility of increasing exports. By the early 1960s, Korea had almost exhausted the possibility of further import substitution in non-durable consumer goods and their inputs. The military government that came into power in 1961 began to shift its policy emphasis from import substitution to export promotion. In more specific terms, the new development strategy has been called "outward-orientation" or "export-led industrialization".[15]

This strategy is characterized as an association or integration to the world economy on the basis of dynamic comparative advantage. This case is seen to account for the recent successes of some developing countries like Korea, Taiwan, Singapore, and a few Latin American countries. From being low-income countries in the 1950s, they have transformed their economies to become major exporters of manufactured goods and are now among the wealthier middle-income countries. But, it is often overlooked that export-led growth can be import-intensive. In the case of Asian NICs, they are singularly unendowed with natural resources, importing large quantities of raw materials and energy. The ratio of imported inputs to total export value

is high. The establishment of new export industries demands capital goods imports. Thus, export-led industrialization tends to make a country's economy more sensitive and vulnerable to external conditions.

Despite this disadvantage, the motivation toward this strategy has been justified, although there was intermittent opposition in the domestic political process. Korea has no sufficient natural resources upon which to base export growth. Before the development of new rice varieties, Korea lacked sufficient land from which to develop an exportable agricultural surplus. Its only recourse is to export manufactures in order to attain a rapid economic growth. In economic terms, the adoption of an export-oriented industrialization strategy was predicated on the understanding that Korea's natural resource base was poor and the realization that further opportunities for import substitution were to be found only in intermediate and durable goods. The limited domestic market for these goods during the mid-1960s could not justify establishing plants large enough to realize technological economies of scale.

The second, perhaps the most convincing justification for this strategy is that no other development strategy could free South Korea from the fear of North Korea's threat. The military power balance between the two Koreas has always been in favor of North Korea since the division of Korean peninsula. The power imbalance in the 1960s, was enough to encourage South Korean political leaders to

develop an industrial base for a military power build-up. This build-up was coupled with a precarious attitude by the U.S. presence in Korea and the incessant guerrilla attacks from the North Korea. Thus, it was perceived that a rapid industrialization could save the country from both poverty and war. The preference of the government to rapid industrialization based on export promotion is perhaps best explained by its positive effects on national defense posture. In fact, the Korean government has allocated more than 75 percent of available investment funds for the heavy industrial sector with linkages to the military industrial sector. In addition, the level of resources allocated for the military sector had dramatically increased. More than 6 percent of the GNP and about 35 percent of public expenditure have been allocated to the military sector on average.[16]

It should be noted that the presence of strong state in implementing policy objective was a key factor to understanding Korea's success for the dramatic expansion in trade. The consolidation of state power in the name of national security had the consequence of destroying the political bases for the articulation of alternative development strategies. There has been a continuity in opposition programs since the 1960s, emphasizing balanced growth, redistributive and welfare policies, expansion of the domestic market, and a reduction of the degree of reliance on exports and foreign capital. These movements

have been successively destroyed by the centralized state power.[17]

In short, the domestic political process right after the military coup in 1961 clearly showed a strong bias to depend on foreign trade expansion in dealing with economic growth strategy. This policy was intensively implemented under the strong and tight state control. Over the course of the 1960s, the military government pursued a high-growth, inflationary course, heavily biased in favor of industrialization. This development strategy would seem successful as far as natural resources are abundant in resonable prices and export markets are accessible for Korea.

Economic Capability: The capability of foreign resource acquisition involves political, military, and economic options. As previously mentioned, the post-war international environment has dictated the mode of resource flows among nations in the context of economic relations as a result of complex reasons.[18] This new environment has given a substantial opportunity to even weaker nations for accessing foreign natural resources, once they have buying powers.

During the 23 years since the start of the First Five-Year Economic Development Plan the rapid expansion of Korean exports has been the main source for foreign exchange earnings. Korean exports have grown at a dazzling annual

rate of almost 35 percent, remaining unmatched by most other developing countries. Over 90 percent of total exports during the 1980s were manufactured goods followed by approximately 4 percent marine products and less than 3 percent agricultural products. Exports of light manufactured commodities, such as textiles, wearing apparel, and shoes, all of which were major items in the past. They are expected to become a less important factor in the the future, since such commodities are based on labor-intensiveness. These commodities face more import restrictions imposed by industrialized countries and more intense competition from other developing countries. The Korean government has promoted exports of heavy industrial products with increased financial resources made available for exporting on a deferred payment basis. The export share of skill-intensive and relatively capital-intensive industries such as industrial machinery, electronics, shipbuilding and finished metal products began to grow substantially since the late 1970s. In fact, machinery exports increased from 20.8 percent in 1981 to 32.6 percent of the total exports in 1984.[19]

Despite this increasing effort in exports, however, the balance of trade of Korea has always been in red, as already shown in Table 4-1. Therefore, it must be assumed that other capabilities in supplying foreign exchange earnings has increased to come up with the constant deficits. Thus far, Korea's trade deficit has been covered by three

principal sources of foreign exchange: grant-type foreign aid, invisible trade earnings, and foreign loans and credits. Above all, grants were a significant source for financing the substantial deficits in the goods and services account of the balance of payments. During the 14-year period from 1947 to 1961, the United States granted $3.1 billion of gratuitous aid to Korea, and about $1 billion from 1962, the year of the first five-year economic development plan, to 1968. The total amount of U.S. aid to Korea has been $4.1 billion since World War II.[20] In addition, some assistance was also provided by various international agencies, including technical assistance from the United Nations Development Program. Japan's Property and Claims Fund provided about $300 million in grant-aid during 1966-75 following the conclusion of the war reparations agreement between the two countries.

As the United States began to reduce the grant-aid to Korea, Korea had to depend on invisible trade and foreign loans to cope with the balance of trade deficits. As we already mentioned above, the government's decision to participate in the Vietnam War opened an additional source of foreign exchange earnings through homeward remittances by troops, skilled civilian workers, and business firms serving in war and reconstruction efforts in the country. Therefore, until the early 1970s Korea marked a surplus in invisible trade.

Although foreign aids and invisible trade surpluses

helped Korea's trade deficits significantly, they were not enough to cope with growing imports. Thus, from the early 1960s, Korea depended increasingly on foreign loans and credits (public and private) as a result of the decline of foreign aid. The normalization of diplomatic relations with Japan, effected in 1965, resulted in the influx of large sums of claim settlement funds (reparations) and commercial credits that were effectively used for development capital, while greatly stimulating Korea's external trade. Through the 1960s, especially in the latter half of the 1960s, the inducement of foreign capital was in full swing. The movements in the aggregate capital account showed large surpluses that more than offset deficits in the current account up to 1970. Until 1984, Korea has induced approximately 23 billion dollars of foreign loan (public and private), as seen in Table 4-2. Until 1975, the share of foreign capital in the nation's total investments took approximately 35 percent in an annual average rate. This high rate has significantly dropped to the level of 10 percent or below since the late 1970s. But, it is no doubt that the nation's capability to induce foreign capital has been the most important factor to attain its current level of trade expansion.

Table 4-2

Table 4-2: Foreign Capital Inflow (in million dollars)

	U.S.	Japan	International Organizations	EC	Others	Total (A)	Total Investments(B)	A/B (percent)
Cumulative Total As of 1975	3,083.9	2,130.7	1,454.9	1,837.1	502.2	9,008.8		Annual average, 35
1976	422.6	107.0	394.2	407.6	230.8	1,562.2	7,170	21.8
1977	123.2	75.6	299.3	65.2	62.9	626.2	10,368	6.0
1978	176.0	97.7	407.1	69.9	67.0	817.7	16,212	5.0
1979	220.0	89.1	445.3	113.8	141.2	1,009.4	22,205	4.6
1980	336.2	136.5	380.4	285.5	377.7	1,516.3	19,157	7.9
1981	457.7	345.7	452.7	233.3	201.8	1,691.2	19,553	8.7
1982	634.7	77.9	869.7	165.5	125.5	1,873.4	19,115	9.8
1983	524.7	704.4	724.5	286.4	427.3	2,568.3	20,928	12.3
1984	109.3	730.6	642.2	288.4	360.2	2,130.2	24,241	8.8
Total	6,087.8	4,395.2	6,070.3	3,752.8	2,496.6	22,803.6		
Weight (%)	26.7	19.3	26.6	16.5	10.9	100		

Source: The Federation of Korean Industries, Korean Economic Yearbook, 1976-1985.

Changing Conditions

Korea's pressure for foreign supplies in natural resources has constantly increased because of population growth and further development of resource-intensive industrialization, as shown in the previous chapter. The efforts of Korean governments since 1962 have supported or induced this pattern in setting development strategy, and no substantial change in their perceptions and undertakings has been made. For example, the Fifth Five-Year Economic and Social Development Plan which started from 1982 was still based on the export-led development strategy with a strong emphasis on the heavy and chemical industries. As one of the governmental reports of the plan forecasts, an increasing demand on commodity imports cannot be reduced in the foreseeable future.[21]

Although the pressure for resource imports has grown, the conditions for keeping it in a secure package are now in doubt at various points. Most of the problems are derived from the deterioration of foreign exchange earnings and stable resource supplies. As we already examined in Table 4-1, the nation's exports have outpaced its imports in the annual average growth rate since 1962. As a result, the nation's balance of trade deficits have notably reduced since the late 1970s. As of 1984, however, the nation's exports couldn't come up with its imports. While Korea's balance of trade is still in the red, other principal

sources of foreign exchange are not in good accounts. Korea's invisible trade earnings which were always in surplus until the early 1970s are now in a precarious situation. After its withdrawal from Vietnam, Korea participated in the Middle East to improve its financial deficits with construction contracts. Thanks to this bold involvement, Korea had a surplus in the balance of invisible trade during the latter 1970s. This situation has reversed because of growing deficits in transportation and investment returns, and the sluggish overseas construction market. Thus, the balance of invisible trade has also become a factor for destabilizing the balance of payments of Korea since the early 1980s.

Table 4-3

Korea's dependency on foreign borrowing has inevitably increased, pressing the burden of foreign debts beyond a resonable threshold. Korea's foreign debt increased from approximately $20 billion in 1979 to more than $40 billion in 1984. As the government indicates, the annual repayment of foreign loans already reached $2 billion in 1984, and it is expected to reach $4.2 billion in 1986.[22]

As for Korea's capacity for handling its foreign debt, the World Bank reported in 1979 that the burden of external

Table 4-3: Regional Composition of Korean Overseas Construction

Region	1967-1973(%)	1974-1975 (%)	1976 (%)	1978 (%)	1980 (%)	Total Cases	Amount (million$)
Middle East	5.7	34.1	97.1	98.0	94.7	1,034	37,154
Southeast Asia	71.0	55.8	1.4	1.1	5.0	316	2,206
Pacific Area	22.3	8.7	0.7	0.2	0.1	114	178
Africa	0.6	1.4	0.6	0.3	0.2	16	241
Latin America	0.4	---	0.3	0.4	---	5	53

Source: Hui-Woo Kim, Our Country's Construction Export to the Middle East and Supporting Policies (Seoul, Korea: Korea Institute for Industrial Economics and Technology, 1982), in Korean, pp. 20-21.

debt is being steadily reduced, and agreed with Korean planners that a growth rate for exports of 16 percent and for GNP of 9 to 10 percent per year could be sustained through the 1980s. It concluded that "confidence in Korea's ability to meet its external debt service obligations is based on the continuation of rapid export growth".[23] However, this evaluation turns out to be too optimistic. Since 1980 the economy has grown only in the 5 to 6 percent range, making foreign debts more than double in 5 years. Table 4-4 shows Korea's burden for foreign borrowings in recent years. It is clear that the nation's burden of foreign capital requirements has steadily reduced, but Korea still needs foreign borrowings. To handle the chronic deficits in current accounts and repayment of loans, Korea had to induce 3.4 billion dollars in 1984. Thus, access to foreign capital is still considered a vital interest to Korea's economy.

Table 4-4

On the other hand, the massive growth of the Korean economy is bringing about foreign calls for import liberalization similar to those aimed at Japan. In the late 1970s, Korean government came under pressure to liberalize imports. The Americans and Europeans wanted Korea to open

Table 4-4: Korea's Foreign Capital Requirements and Their Financing (in billion dollars)

	'80	'81	'82	'83	'84
Requirements					
Current Acount Deficits	5.3	4.4	2.7	1.6	1.3
Repayment of Loans	1.6	1.8	1.4	1.7	2.0
Imports on Deferred Payment	0.2	0.2	0.6	0.7	0.7
Increase in Foreign Exchange Reserves	0.9	0.3	0.1	0.1	0.7
Total	8.0	6.7	4.8	4.1	4.7
Financing					
Foreign Loans and Bank Loans	3.4	5.2	3.0	2.5	3.4
Others	4.6	1.5	1.8	1.6	1.3

Sources: Yonhap News Agency, Korea Annual, Various Issues; Ministry of Culture and Information, A Handbook of Korea, 1983.

its markets. As a result, Korea announced a large-scale liberalization effort. In addition, overwhelming Korean competition abroad resulted in the imposition of import barriers overseas, causing Korean firms to lose hundreds of millions of dollars. Korean export growth had been built around a fairly narrow range of products. In 1970 almost 60 percent of exports were accounted for by textiles, apparel, plywood, and wigs. The exports of these products were successively blocked by the introduction of bilateral trade-restraint agreements, ushering in the era of protection. Thus, the possibility of increasing export has been constrained in the growing movement of protectionism.

Aside from Korea's financial capability in terms of imports, the external conditions of resource supplies have been in a precarious situation. Resource producing countries mainly from Third World have gained substaintial power on their assets. The success of the oil producers in 1973 led to a revolution in the thinking of developing countries exporting natural resources. Producer organizations in copper, bauxite, iron ore, bananas, and coffee were either formed or took on new life after 1973. Although their success has been in doubt, other possibilities to interrupt resource flows cannot be completely ignored. At the same time, the Third World issued a call for the establishment of a new international economic order in which developing countries generally supported lower trade barriers. Those areas were located

where they can compete best with foreign producers, while insisting on their prerogatives to protect other, more vulnerable domestic industries in terms of world trade.

One of the factors for strengthening political leverage of developing countries on their natural resources was that industrialized countries were becoming more dependent on some resources from foreign supplies. While overall consumption was rising, extraction in domestic resource bases was becoming depleted or increasingly expensive. Supplies in the underdeveloped countries, in contrast, were plentiful and production costs were low. The result was that developed countries' raw material imports, most of which came from less developed countries, represented a high percentage of consumption. The resultant price inflation and supply shortages in commodities in the early 1970s demonstrated the problem of supply security of resource importing countries. Prices and supply became a public political issue in the developed countries through their impact on national economic health and even on national security.

While increasingly concerned about price and availability of supply, the developed countries in the West were decreasingly able or willing to assure such supply through political and military action. Political control was undermined by the end of colonialism and the declining influence of the West in Third World governments has been further ensued by the North-South entanglement.

Furthermore, changing public attitudes and the risk of escalation constrained military action to protect developed economic interests.[24]

This trend has been a serious dilemma for Korea along with other NICs. They couldn't overly participate in either North or South since their economic structures are dependent on both sides. The NICs found themselves in an ambiguous position. They continue to forge bilateral relations with other developing countries and seek preferential ties with northern partners where possible. For example, as a large borrower, Korea strongly supports the South's proposals to increase the compensatory financing facilities of the IMF and international liquidity in general. On the other hand, as a large importer of raw materials, Korea is concerned that stabilization schemes might lead to restrictions on supply and rising prices. In other words, Korea and other NICs have kept their positions in the preference for bilateralism on the issue of North-South conflict.

In addition to the emergence of Third World power, the international economic order has been further deteriorated by the erosion of the Bretton Woods system. The system represented in the IMF and GATT worked well until the proclamation of the "Nixon Doctrine" in 1971. While West Germany and Japan have returned their economic prosperity in the Bretton Woods system, the U.S. economy started to lose the competitive edge they once held in the world market. Gold continued to flow out of the United States, and large

sums of overvalued dollars piled up abroad, especially in West Germany and Japan. In August 1971 President Richard Nixon announced the suspension of full convertibility between gold and the dollar, in essence bringing an end to the Bretton Woods system.

The retreatment of the U.S. hegemonic role was not limited to the erosion of the post-war international economic order. The Nixon Doctrine imposed the weakened U.S. commitment in Korea. In the meeting with President Park in 1969, President Nixon emphatically stated the concept of self-help and self-reliance, warning that all the aid in the world would not help the people who are unable or unwilling to help themselves.[25] The Nixon Doctrine was implemented in the U.S.-ROK security relations which underwent profound changes through incremental decisions in the early 1970s. The U.S. removed 24,000 troops from South Korea by December 31, 1973. Korea's political leaders concluded that U.S. policy toward Korea would be flexible according to changes in international and American domestic political environments with regard to the involvement of U.S. ground troops in a renewed conflict. This fear was reinforced under the Carter Administration which tried to further withdraw the U.S. troops from Korea.

The decline of the U.S. military commitment in the Far East poses not only a threat from North Korea towards South Korea, but also a threat to the economic security of those countries which are heavily dependent upon imports of

natural resources. There has been a growing concern among Asian countries on the enhanced Soviet military capabilities in the Far East since the late 1970s. One study of the Soviet naval forces in the Far east concluded that the Soviet Pacific fleet (the second largest of the four bases in the deployment) has increased its forces since the late 1960s, and that its scope of activities has widened to cover the Indian Ocean.[26] Any interruption of the Soviet naval forces against the supply routes of Asian trade dependent countries would pose a serious threat to their survival.

The final factor for destabilizing supply security is growing scarcities in some natural resources in the global level. Until the early 1970s, access to natural resources was not viewed as a major problem in resource dependent countries. The only concern was to export enough to pay for their imports. The situation began to deteriorate after a wide concern for the global resource availability in relation to the growing population. Although the pessimistic conclusion of the Club of Rome has been doubted, the physical depletion of the vital non-renewable resources such as oil, coal, iron ore, and others will be inevitable in the future. Unless technology creates new resources at a resonable cost, a growing depletion of some resources will make the issue of resource supply more sensitive in international politics. A security threat from such an extreme case may strike the weaker states which depends on foreign resources.

In short, the conditions of supply security have changed by many factors since the disintegration of the post-war international system. Under the U.S. hegemonic role, such a weaker actor like Korea could import a large quantity of natural resources from other countries at a resonable level. While the motivation toward this pattern is still strong, its supply capability and conditions are not as optimistic as in the past. The political process in Korea is still overshadowed by the issue of export promotion. However, the issue of supply security is much more critical in the sense that Korea's buying power cannot cope with a likely interruption of the sea-lanes in Indian Ocean or a cut-off of the oil supply by an Arab states. Korea's vulnerabilities in resource supply need to be fixed at a sustainable level, since the country faces an aggressive enemy which tries to take advantage of any opportunity resulting from Korea's economic and political instability.

Structure of Korea's Foreign Trade

As mentioned in the beginning of this chapter, the expansion of Korea's foreign trade has been dramatically proceeded. Consequently the country's economic well-being has substantially improved. In the ecological dimension, the country's problem of resource shortages has been appropriately coped with throughout the management of

foreign trade. As our new conceptualization of national security indicated, however, the increased level of a country's trade often produces sensitivity and vulnerability syndromes. The effective management of these problems is not unattainable, but it demands a very complex set of policy techniques. The failure to cope with these problems often causes a nation to become subject to domination and manipulation by other powerful nations. In order to reveal this vulnerable position, we have to examine the structure of Korea's foreign trade.

As shown in Table 4-5, Korea's trade is highly concentrated in particular commodity and product groups. On the import side, it comes as no surprise to learn that natural resource imports have taken a dominant share over the last two decades. In the 1984 figure, this share reached 65.7 percent. In particular, vital natural resources,such as food, energy, and non-fuel minerals, share almost 50 percent of the total imports. However, capital-goods imports also account for 33 percent of the total imports. This simple statistics implies that Korea is sensitive to both developing and developed countries to maintain its current level of economic well-being.

Table 4-5

Table 4-5: Changing Pattern of Korea's Foreign Trade by Commodity Groups (in percent)

Imports	1965	1975	1984	Exports	1965	1975	1984
Raw Materials (including intermediate goods)	48.5	38.2	34.4	Heavy and Chemical Products	1.9	29.5	56.8
Machinery and Transport Equipments	17.2	26.2	31.6	Textile	22.4	34.5	24.2
Energy Resources	7.1	19.1	22.2	Non-textile Light Industrial Products	31.3	24.4	14.1
Food Products	16.9	13.7	9.1	Food Products	22.2	10.4	4.7
Non-cereal Consumer Goods	10.3	2.8	2.7	Mining Products	22.2	1.7	0.3

Source: Office of Customs Administration, Statistical Yearbook of Korea's Foreign Trade, 1970-1985.

On the export side, the exports of industrial goods have significantly increased, constituting 95 percent of the total exports in 1984. By contrast, the share of food and mining products has decreased from 44.4 percent in 1965 to only 5 percent in 1984. It is interesting to see that Korea's main category in export items is already in the realm of heavy and chemical industrial products. Until recently, the main exporting items for Korea were limited to several light industrial products such as textiles, clothing, footwear, wood products, wigs, and eyelashes. This pattern began to change, as Korea moved into a heavy-industrial structure.[27] As a result, Korea's major export items now include such heavy industrial products as car, ships, iron and steel, machinery, and so forth., in addition to light industrial products.

If we look at the geographical distribution of Korea's trade, Table 4-6 reveals that Korea has been heavily dependent on two trade partners --- Japan and the United States. In figures for 1984, the share of two nations in Korea's imports and exports is around 50 percent, although the share of imports is slightly lower than that of exports. This share is much lower than that of 1970 which marked more than 70 percent in both exports and imports. This heavy dependence on two partners becomes a typical example to show a pattern of dyadic dependence. As Albert Hirschman already argued in his book of National Power and the Structure of International Trade, this pattern gives the

larger partner a basis for influence toward a small partner.[28] While Hirschman was concerned with the overt manipulation of this asymetrical bilateral trade relationship, this is not the only concern. Bilateral dependence also ties the smaller's economy to the economic performance of the greater.

Table 4-6

In addition to the overall trade distribution, Korea's balance of trade by countries will reveal the country's vulnerability in a more specific form. In 1984, Korea's oil imports cost $5.8 billion. Three billion dollars' worth of manufactured goods were exported to oil-exporting countries, leaving a trade deficit with these countries of $2.8 billion. An additional trade deficit of $3 billion was run with Japan, mainly because of imports of a wide range of intermediate goods to producce industrial products. Another deficit was created by the trade with Oceanian countries such as Australia and New Zealand, leaving almost 1 billion dollars' deficit to import energy and minerals like coal, iron and copper ore. To make up for these deficits, Korea enjoyed a $3 billion surplus in trade with the United States and a $2 billion surplus in trade with Western Europe and some Asian countries (Hong Kong and Singapore).

Table 4-6: Geographical Distribution of Korea's Trade (in %)

	1970		1975		1980		1984	
	E	I	E	I	E	I	E	I
U.S.	47.3	28.5	30.2	27.9	26.3	21.9	35.8	22.4
Japan	28.1	40.8	25.4	34.5	17.4	26.3	15.7	24.9
EEC	5.1	10.0	18.4	9.3	17.8	8.5	14.3	12.1
Canada	2.7	1.3	4.5	2.5	3.4	2.2	2.0	2.1
Oceania	0.8	0.9	1.7	3.1	1.6	3.5	1.6	4.3
Asia	7.9	7.5	6.9	5.4	10.3	6.3	18.4	12.8
Middle East	1.9	7.5	8.1	21.4	14.1	27.0	7.9	15.4
Latin America	0.1	0.2	0.4	0.2	1.3	1.1	3.7	4.6
Africa	2.1	0.3	4.0	0.6	4.3	0.5	1.5	1.3
Others	4.8	2.9	0.4	0.1	3.4	2.5	---	---

* E: Exports I: Imports

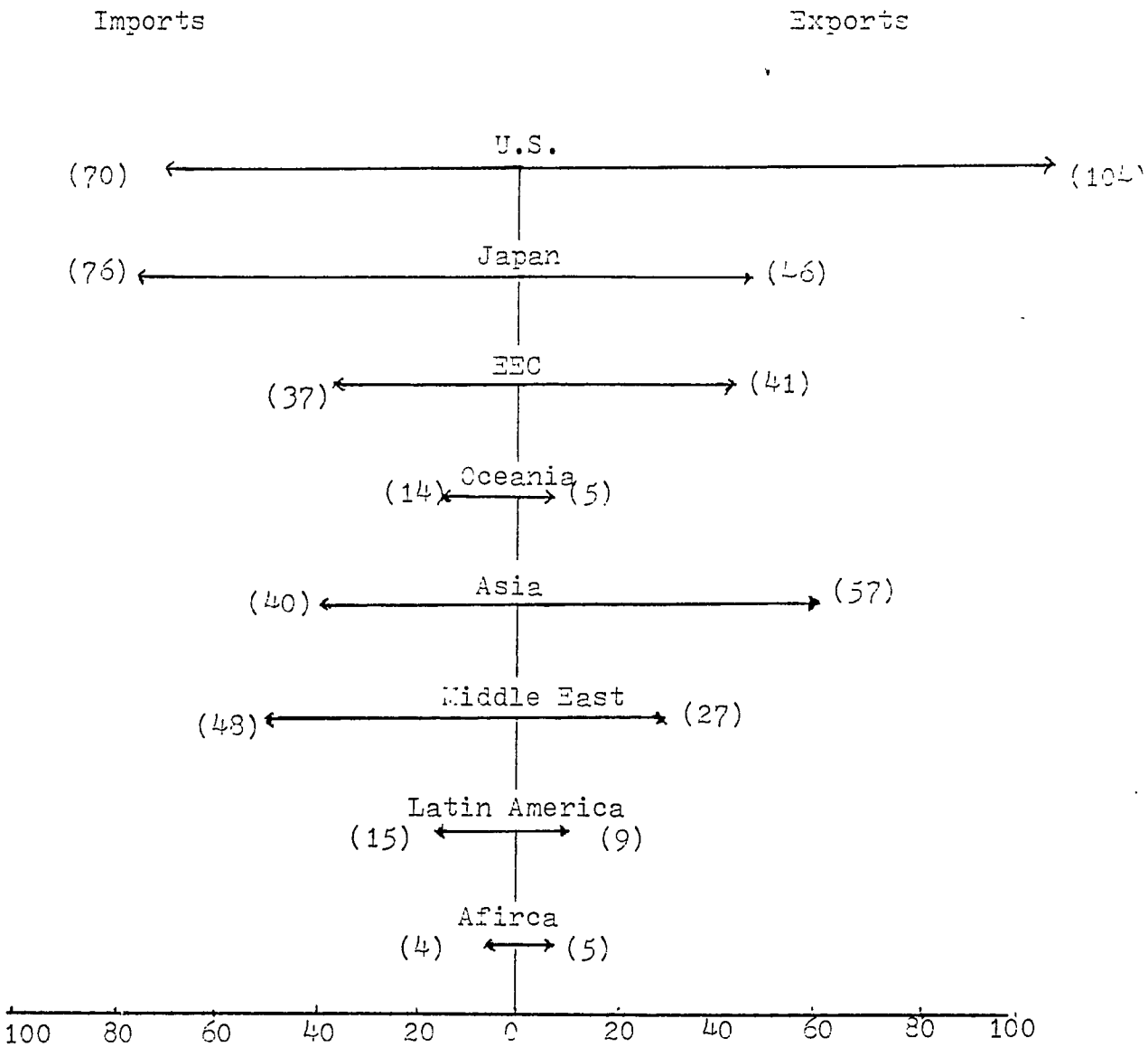
Source: The Federation of Korean Industries, Korean Economic Yearbook, 1970-1985.

Figure 4-1

Korea's vulnerable position has been manifested in the relationships with the United States. For example, the U.S. Department of Commerce and the U.S. International Trade Commission issued determinations on 15 cases filed against Korean Exports alleging dumping, subsidization or other kinds of unfair trade practices in 1984. Of those 15, seven ended in complete exoneration of the Korean companies.[29] In addition, the successive pressure to open Korea's markets already made Korea stand at about a 90 percent. "Import Liberalization Ratio". This vulnerability has in turn created ever-increasing political instability in domestic politics by recalling nationalistic slogans from disenchanted and excluded classes and groups.

An examination of the economic relationships between the United States and South Korea can facilitate a discussion of an increased economic interdependence and its implications for national security. Economic ties between the two countries have grown rapidly over the past 30 years. During this time the relationship between the two countries has changed considerably: the partnership has moved steadily from the one-way, client-patron relationship that existed during the 1950s and 1960s toward a more mutually

Figure 4-1: Composition of Korea's Trade by Destination in 1984 (in 100 million dollars)



Source: Office of Customs Administration, Statistical Yearbook of Foreign Trade (in Korean), 1985.

beneficial, two-way association. Both countries derive substantial benefits from their close economic ties. Although South Korea has recently broadened its economic horizons, the United States still looms as South Korea's most important economic partner. The United States absorbs more of South Korea's exports and supplies more capital than any other country. The economic relationship is not nearly as important to the United States. But, South Korea is the seventh largest market for the United States and its largest non-OPEC LDC market as of 1984. It is also the U.S. largest market in Asia except for Japan. The United States sells more to South Korea than it does to Brazil, China, or Australia and almost as much as it sells to Italy or Saudi Arabia.

The trade relationship between the two countries has grown by leaps and bounds over the past three decades. The bilateral trade has surged dramatically, since the early 1960s. During the past quarter century, bilateral trade grew at an average annual rate of 23 percent. This trade rate recorded over $60 billion in 1984, a spectacular jump from $183 million in 1961. From 1974-84, U.S. exports to South Korea grew at an average annual rate of 14.5 percent, compared with 7.8 percent for overall U.S. exports. During the same period, South Korea's exports to the United States grew at an average annual rate of 21.5 percent, higher than the overall U.S. import growth rate of 12.4 percent.

Table 4-7

At first sight, this increased economic interdependence between the two countries may be perceived as something that is benign to spill-over effects to other dimensions, as argued in the theories of functionalism.[30] However, it is more accurate to say that economic interdependence offers the possibility of both conflict and cooperation in the relationships between two countries. The question of what consequence will be brought from economic interdependence depends on the structure and characteristics of economic interdependence, and the coordinating process between two countries. A high degree of economic interdependence between two countries can be a source of political power leverage for the one actor over the other. It is not surprising that one sees references to a "crisis of interdependence" and hears talk of neo-mercantilism.

Table 4-7 shows the overall structure of trade relationship between the United States and South Korea. Until the beginning of the 1980s, the trade balance between imports and exports was kept in a fairly good profile. Over the years, South Korea imported slightly more than it exported to the United States. This is a desirable pattern for South Korea, which wants to encourage the United States to be more concerned about its military security commitment

Table 4-7: South Korea's Trade with the United States (in millions of dollars)

Year	Total Exports	Exports to the U.S.		Total Imports	Imports to the U.S.		Balance of Payments with the U.S.
		Amount	Share(%)		Amount	Share(%)	
1961	40.9	6.9	16.3	316.1	143.3	45.4	-136.5
1965	175.1	61.7	35.2	463.4	182.3	39.3	-120.6
1970	835.2	395.2	47.3	1,984.0	584.8	29.5	-189.6
1971	1,067.6	531.8	49.8	2,394.3	678.3	28.3	-146.5
1972	1,624.1	759.0	46.7	2,522.0	647.2	25.7	111.8
1973	3,225.0	1,021.2	31.7	4,240.3	1,201.9	28.3	-180.7
1974	4,460.4	1,492.1	33.5	6,851.8	1,700.8	24.8	-208.7
1975	5,081.0	1,536.3	30.2	7,274.4	1,881.1	25.9	-344.8
1976	7,715.3	2,492.5	32.3	8,773.6	1,962.9	22.4	529.6
1977	10,046.5	3,118.6	31.0	10,810.5	2,447.4	22.6	671.2
1978	12,710.6	4,058.3	31.9	14,971.9	3,043.0	20.3	1,015.3
1979	15,755.5	4,373.9	29.1	20,338.6	4,602.6	22.6	-228.7
1980	17,504.9	4,606.6	26.3	22,292.0	4,890.0	21.9	-283.4
1981	20,992.6	5,560.9	26.5	26,131.4	6,049.7	23.2	-488.8
1982	21,616.1	6,118.7	28.3	24,250.8	5,955.8	24.6	162.9
1983	24,222.5	8,127.8	33.5	26,192.2	6,274.4	24.0	1,853.4
1984	29,244.9	10,478.8	35.9	30,631.4	6,875.5	22.4	3,603.3

Source: Economic Planning Board, Major Statistics of Korean Economy, 1985.

to South Korea. In other words, as far as South Korea can be sustainable in its overall economic performance, a trade imbalance in favor of the United States can provide South Korea with a substantial opportunity in its military security deal with the United States.

Since 1982 South Korea's exports to the United States have rapidly increased, thereby revealing a significant surplus in 1984. In contrast, the United States has long been plagued by balance of trade deficits. Several industrial sectors in the U.S. market, such as textiles, apparel, footwear, and toys, have been dominated by a growing penetration of newly developing countries. Though many of the problems facing these industries are domestic, including technological change, declining productivity, changing tastes, fashions, and low elasticities of demand, the American industries in those sectors have recently responded to the problems of adjustment through political action aimed at import restrictions. Domestic political process in the United States increasingly seeks to force the costs of adjustment onto others, with the threat that protectionism could spiral downward into complete closure. As a result, the relationships between the United States and Asian NICs have recently been overshadowed by economic issues involving trade conflict.

U.S. pressure toward South Korea is directed in two ways: demands to open South Korea's market to foreign concerns on the one hand, and successive measures to cut

South Korea's exports to the United States. The U.S. government has faced domestic pressures regarding imposition of protectionism. The U.S. International Trade Commission (ITC) concluded in 1985 that American industries, especially shoemaking industry, face serious harm from the imports of Korean and Taiwanese-made nonrubber shoes. It also said that it would recommend protectionist measures to solve this problem.[31] A series of proposed protectionist bills in the U.S. Congress has also deepened this pressure. For example, the initial version of the popular Jenkins Bill would have cut U.S. imports of textile and clothing, primarily from East Asia, by as much as 40 percent.[32] The U.S. government has successively rejected any idea regarding protectionist legislation. Instead, it proposed that market opening measures be used to increase U.S. exports rather than resorting to protectionism to reduce U.S. imports. The U.S. Trade Representative then initiated a number of investigations under Section 301 of the Trade Act in an attempt to speed up market opening in such countries as South Korea. The objective is to settle these matters quickly, increasing U.S. companies access to the South Korean and other markets. As a result, South Korea has faced intensified demands from the United States to permit its access to such markets as cigarette, insurance, agricultural products, and glassware products, in addition to a demand of intellectual property rights.

It should also be revealed that despite the U.S.

government standing against any attempt to impose protectionist measures, South Korea's economy should increasingly meet various threats from the United States to cut South Korea's exports. For example, it was reported in 1985 that the U.S. administration is moving to impose tariffs on imported nonrubber shoes instead of implementing the global quota system urged by American shoe manufacturers. It was estimated that this measure would cause South Korean footwear exporters to lose some 16 percent of their existing U.S. market share.[33] The U.S. Trade Representatives (USTR) in the same year decided to remove seven Korean export items from the list of Generalized System of Preference (GSP) for one year. A more critical attempt to block South Korea's exports have been seen in anti-dumping judgements from the United States, as previously mentioned.

South Korea has reacted as if the U.S. government were adding to American protectionism rather than substituting for it. The South Korean government has positively responded to the pressures from the United States. While the government decided to liberalize its market more to developed countries, it has also moved to voluntarily restrain its exports to the United States. These reactions from South Korea have brought some painful effects on its domestic politics. Above all, the government has had to meet serious political protests which involve both anti-government and anti-America movements. The political

protest is attributable mostly to groups that would have been adversely affected by market opening. They have appealed to nationalism, just as advocates of U.S. protectionism have addressed American national feeling. On the other hand, the negotiation between the U.S. and South Korean government has not been enough to quell current trade frictions. South Korean proponents of liberalization have received little credit from the United States for what they have already accomplished and have had the balance of their task made more difficult. Economic frictions between the two countries will not be resolved in foreseeable future.

Korea's choice to get away from this skewed trade relationship lies in an effort to diversify its markets. In fact, the motivations for market diversification are clear, as shown in Table 4-6. Between 1970 and 1984 Korea expanded its exports to the EEC from 5.1 percent of total exports to 14.3, while exports to other LDCs jumped from about 12 percent to over 33 percent. The result was a correspondingly dramatic decrease in the degree of dependence on the American and Japanese markets. Diversification also reduces the effect of external shocks. A recent study has shown that export promotion and diversification helped insulate Korea from the severe recession of its major trading partners, enabling the economy to grow at a respectable level during 1974 and 1975.[34] Finally, diversification is driven by the need to secure access to inputs, simultaneously balancing trade with

those countries on which Korea is reliant. Korea has actively sought raw materials in Southeast Asia, oil in the Middle East and capital and technology in Europe.

A wide variety of instruments has been used in achieving Korea's market diversification. The most obvious effort has been exerted through diplomatic channels. In 1972 the government permitted trade with "nonhostile" Communist countries, while formal diplomatic relations with Africa, Latin America, and the Middle East continued to be strengthened. Embassies are given export targets, which they are expected to meet through trade promotion conferences. Although these instruments differ little from those of other states, the level of coordination between business and states is unusually high in Korea. The distinction between public and private interests, between "high" politics and "low" is not clearly drawn.

The best known of Korea's diversification efforts has been the sustained push into Middle East construction. Following the oil crises, the Middle East was seen as a lucrative market for the expansion of Korean construction firms. A unique set of economic and political complementarities existed. Korea was seeking to recoup large bilateral deficits caused by the surge in oil prices. Labor-poor Saudi Arabia, itself interested in diversification, had formulated ambitious development plans which called for extensive construction. Korea would gain not only from the contracts themselves, and from workers'

remittances, but from export of materials as well.[35]

Korean efforts in Europe was significant in cementing relations with France through the award of important contracts to two French firms in connection with the construction of two nuclear power plants. This switch, after a long nuclear relationship with Westinghouse, was clearly based on perceptions of the costs of continued dependence on the United States. In addition, Korea saw closer ties with France as a way of gaining better access to Africa. The French and the Koreans are now participating in a joint venture to mine uranium in Gabon. The French Minister for Foreign Trade has suggested the possibility that France could play a role in facilitating Korea's ties with Mainland China.[36]

A final area of expansion of external ties has been Southeast Asia. ASEAN has been the target of Korea's increasingly aggressive raw materials policy. Knowing that self-reliance would be impossible, the government has sought to develop long-term contracts through the "development/import" formula. Korean firms, both private and public, invest in overseas resource development in return for supply contracts. In return for a stable supply of crude oil from the project, Korea would provide 50 percent of the capital for exploration, sweetening the deal by extending technical assistance to rural electrification projects through the state-owned Korea Electric Company. Korea's increased profile in the region was signaled by the

President's ASEAN tour of 1981.[37]

Although Korea has aggressively pursued the diversification of its markets, the present trade structure still maintains a skewed pattern. The limits of market diversification make bilateral bargaining a critical component of Korea's trade strategy. There may be a range of bargaining strategies small states can pursue within the context of continued bilateral dependence to extract increased gains. For example, Korea has sought to gain leverage with both Japan and the United States by directly linking economic issues to Korea's military strategic importance as a military ally. This linkage was made by President Chun in his 1981 meeting with Reagan, and was clearly specified in the request to Japan for $6 billion in aid and loans during the Fifth Five-Year Plan period. In addition, Yoffie and Odell have shown that under certain conditions, other strategies and tactics can be effective as well. These include the forging of transnational coalitions, negotiating for ambiguity and flexibility in bilateral trade deals and bargaining for long-run gains.[38]

To summarize these observations, Korea's trade position is extremely vulnerable especially to the reactions from the United States and Western European countries on the export side. While the demand for producing trade surplus is increasingly acute because of natural resource shortages and repayment of foreign debts, the country's export markets are

heavily limited to a small number of countries. Furthermore, the nation's export items are vulnerable to the rising protectionism in its major trade partners. On the other hand, Korea should develop a secured pattern of foreign relationship with resource-rich countries for its natural resource supplies. It should be also recognized that the nation's dependence of technology and foreign capital has been growing. This problem is pronounced in the nation's relationship with Japan: Korea has to suffer the chronic trade deficits with Japan to induce technology and foreign capital transfer. In short, although Korea's option for trade expansion has to some extent relieved the problem of resource shortages and improved the level of economic well-being, it has also cost the nation new problems of sensitivity and vulnerability. The management of these problems often demands a costly effect on the nation's total security and political autonomy.

Footnotes

1. For this kind of reasoning, see Clark A. Murdock, "Economic Factors as Objects of Security: Economics, Security and Vulnerability", in Klause Knorr and Frank N. Trager, (eds.), Economic Issues and National Security (Lawrence, Kansas: University Press of Kansas, 1977), pp. 78-81; Dennis Pirages, The New Context for International Relations: Global Ecopolitics (North Scituate, Massachusetts: Duxbury Press, 1978), p. 16; John Gerard Ruggie, (ed.), The Antinomies of Interdependence (New York: Columbia University Press, 1983), p. 18.

2. Davis B. Bobrow, and Robert C. Kudrle, "Western Theory and Japanese Practice: A New Geopolitics", Paper prepared for presentation at the XIIIth World Congress of the International Political Science Association, Paris (July 1985), p. 7.

3. Joan Edelman Spero, The Politics of International Economic Relations (New York: St. Martin's Press, 1981), pp. 6-9; Robert Gilpin, "Three Models of the Future", in Michael Smith, and others, (eds.), Perspectives on World Politics (Croom Helm, London: The Open University Press, 1981), p. 398.

4. U.S. Overseas Loans and Grants and Assistance from International Organizations: Obligations and Loan Authorizations (Washington, D.C.: Agency for International Development, 1974), p. 74.

5. The concept of the relative strength of the state has been introduced in some writings. They suggest that the strength of the state can be measured along two dimensions, what may be called "autonomy" and "capacity". The former refers to the extent that decision-making elites are capable of organizationally insulating themselves from societal pressures by controlling channels of interest representation and autonomously defining national objectives. The latter can be measured by the capacity to extract resources and to implement policies against social sectors (Haggard and Moon, 1983: 141; Krasner, 1978: Chapter 3; Skocpol, 1979).

6. All of these together can be considered a nation's core values or most basic foreign policy goals, a kind of "Holy Trinity". For the discussion of the relationships among these objectives, see Hans Morgenthau, "Another Great Debate: The National Interest of the United States", American Political Science Review, 46 (December 1952), pp. 961-988.; Arnold Wolfers, Discord and Collaboration (Baltimore: Johns Hopkins University Press, 1962), pp. 67-80.; Davis B. Bobrow and Robert T. Kudrle, "Western Theory and Japanese Practice: A New Geopolitics", op. cit.,

pp. 9-10.

7. Davis B. Bobrow and Robert T. Kudrle, "Western Theory and Japanese Practice: A New Geopolitics", op. cit., p. 9.

8. Bum-Shik Shin, Major Speeches by Korea's Park Chung Hee (Seoul, Korea: Hollym Corporation Publishers, 1970), vii.

9. For years, Korea and Japan had carried on intermittent and unsuccessful negotiations for normalization of relations. Several points of disagreement existed, but one of the major disputes between the two sides had been the Korean demand for reparations for the Japanese exploitation of the peninsula and the "pain and suffering" of the Korean people during forty years of Japanese rule. The Japanese had refused to consider reparations, claiming that their period of rule had been of immeasurable benefit to the Korean people, and had counterclaimed for reparations for property seized from the Japanese at the time of liberation. see Joungwon A. Kim, Divided Korea (Cambridge, Mass.: Harvard University Press, 1975), pp. 241-242.

10. The Rhee government was as anti-Japanese as anti-Communist in word and deed. Much of Rhee's anti-Japanese sentiment was understandable, for he spent a major portion of his life in fighting against the Japanese. His own bitter feelings were strongly reflected in Korea's foreign policy toward Japan. see Youngnok Koo, "The Conduct of Foreign Affairs", in Edward Reynolds Wright, (ed.), Korean Politics in Transition (Seattle and London: University of Washington Press, 1975), pp. 220-222.

11. The official position of the United States was in strong support for the rapprochement between Japan and Korea. For the U.S., the normalization between the two countries could bring an obvious advantage. In other words, it could help U.S. attain its goal of stability in the Far East while reducing its expenditure in Korea. If Japan could be persuaded to give economic aid to Korea, it could diminish Korean reliance on U.S. aid. As shown in the latter stage, U.S. grant in aid to Korea was declining rapidly as the agreement with Japan was finally concluded. Korea Annual 1967, p. 165.

12. The agreement stipulated that Korea would settle for a $300 million grant from Japan, a $200 million loan as economic aid, $1 million in commercial credits, and an unspecified amount in Japanese goods and services, to be paid to Korea over a ten year period. Joungwon Alexander Kim, Divided Korea, op cit., p. 242.

13. In the late 1960s when South Korea dispatched its military to Vietnam, North Korea still enjoyed military superiority over the South. Furthermore, North Korea

launched a Vietnam-type guerrilla warfare to unify the Korean peninsula under its control by forces. One study reveals that from the late 1960s numbers of North Korean hostile actions directed against the South rose sharply. Jong-Chun Baek, "Probe for an Alternative Strategy of Conflict Resolution in the Korean Peninsula", Paper presented to the Second International Symposium at Korea Military Academy, (September, 1983), pp. 27-34.

14. The United States provided Korea with extensive benefits in return for the Korea's decision to involve in the Vietnam War. The U.S. concessions to Korea in exchange for the commitment was expressed in the announcement of U.S. Ambassador to Korea Winthrop G. Brown. Among them, it was the most notable that Korea received a great amount of commercial loans from Western Developed countries. During 1966 and 1967, Korea received a total of $256.1 million in private commercial loans. Korea Annual 1969, p. 197.

15. Three major contending positions can be identified to describe development strategies of developing countries: 1) outward-oriented strategy; 2) the NIEO (New International Economic Order) style; 3) dissociation or self-reliance strategy. John Gerard Ruggie, (ed.), The Antinomies of Interdependence (New York: Columbia University Press, 1983), pp. 8-17.

16. Edward Azar, and Chung-in Moon, "Third World National Security: Toward A New Conceptual Framework", International Interactions, Vol. 11, No. 2, p. 122.

17. On the character of the opposition, see Sungjoo Han, The Failure of Democracy in South Korea (Berkeley: University of California Press, 1974), especially for the early stage; on the 1967 NDP platform, see John Kie-Chang Oh, Korea: Democracy on Trial (Ithaca: Cornell University Press, 1968). For the state power vis-a-vis social sector, see Stephan Haggard and Chung-in Moon, "The South Korean State in the International Economy: Liberal, Dependent, or Mercantile?", John Gerard Ruggie, op. cit., pp. 141-152.

18. The reason for this change of international system has been an object of hot debate. But, one explanation seems quite persuasive; "It is no longer economically feasible for major powers to wage protracted warfare in small, distant countries such as Vietnam. The economics of such warfare place unmanageable demands on the contemporary industrial powers. Military equipment is costly, and heavy military expenditures accelerate already high rates of inflation. Increasingly, nuclear powers are forced into the dilemma of using either their most powerful weapons or refraining from getting involved at all" (Pirages, 1978; 36).

19. Ministry of Culture and Information, A Handbook of

Korea, op. cit., p. 501.

20. U.S. aid to Korea can be categorized as follows: aid for defense and security (non-project aid), surplus agricultural commodities (PL. 480), aid for development (project aid), and Civil Relief in Korea (CRIK), United Nations Korean Reconstruction Agency (UNKRA), and so on. The largest portion of total aid has been the assistance for defense and security (55%), followed by surplus agricultural commodities (28%), and aid for development (14%), with the smallest portion of aid in the category of CRIK and UNKRA (1.8%). Seung-Yun Lee, "Major Achievements and Problems of the South Korean Economy: 1962-74", in Young C. Kim and Abraham M. Halpern, (eds.), The Future of the Korean Peninsula (New York: Praeger Publishers, 1977), p. 23.

21. The report says: Total commodity imports are projected to reach $55.5 billion in 1986, increasing at an annual rate of 17.1 percent. The import structure of Korean economy is not expected to change very much over the fifth plan period. Presently, non-competing imports account for over 40 percent of all commodity imports. Imports of capital goods and raw materials for exports are not expected to decrease in any significant degree in relative terms over the plan period. This report also forecasts that an excessive growth of imports would be met as the government intends to make the extent of import liberalization. Ministry of Culture and Information, A Handbook of Korea, op. cit., p. 505.

22. The report also indicates that total foreign capital required to meet the current account deficits, debt service, etc. is projected to rise to $10.7 billion in 1986 from the $7.9 billion anticipated in 1981. The Ministry of Culture and Information, ibid., p. 506-507.

23. Parvez Hasan and D.C. Rao, Korea (Baltimore: Johns Hopkins University Press, 1979), pp. 8-9. 47.

24. The strategy of the NICs on the issue of the NIEO debates is well expressed in Haggard and Moon's article (1983; 160-165). In addition, one writer summarizes the Korea's position as follows; "Many people both inside and outside the government think that the NIEO issues are relatively less important for the current and future Korean economy than domestic economic policies and bilateral economic negotiations with certain countries". Soo-yong Kim, "The New International Order and Korea", Korea and World Affairs, Vol. 5, No. 1, 1981.

25. President Nixon expressed his desire to reduce the U.S. military presence in Asia and to reassess U.S. policy toward Asian countries so as to avoid future Vietnams. The President stated that future U.S. policy in Asia would seek to avoid military intervention which could involve the U.S.

in situations like Vietnam. See U.S. Congress, Senate Subcommittee on United States Security Agreements and Commitments Abroad of the Committee on Foreign Relations, United States Security and Commitments Abroad: Republic of Korea (Washington, D.C.: 1970), p. 1724.

26. The intention of Soviet Union with its increased naval forces is understood to support its foreign policy on the Third World countries in a more aggressive way. Min Yong Lee, The Political-Military Analysis of the Soviet Naval Increase, A Master's Thesis (Seoul, Korea: Korea University, 1981), pp. 111-117.

27. The background of Korea's take off to heavy-industrial structure can be explained in the multiple causal structure. Economically, it was to find a new niche in the evolving international division of labor. Strategically, it was motivated by the quest for increased military self-reliance. And politically, it was linked to the intention of consolidating further the authoritarian political leadership (Haggard and Moon, 1983; 173-176).

28. Hirschman's proposition is that dependency emerges where country A takes a large percentage of trade from country B, but country B's trade is a small part of country A's total trade. He illustrates this by reference to Bulgaria's trade with Germany: 52 percent of its imports came from and 59 percent of its exports went to Germany, but that trade only amounted to 1.5 percent of German imports and 1.1 percent of German exports (1965; 34-35).

29. Un-Suh Park, "U.S.-Korean Bilateral Trade Opportunities and Problems", in Korea's Economy, Vol. 2, No. 1 (January 1986), p. 12.

30. This belief is found in the theories of international integration. In the framework of functionalism, many scholars developed a proposition that the development of collaboration in one technical field leads to collaboration in other technical fields. See Ernst B. Haas, Beyond the Nation State (Stanford: Stanford University Press, 1964), p. 48; Philippe C. Schmitter, "A Revised Theory of Regional Integration", International Organization, Vol. 24, No. 4 (1970), p. 846. This belief is also found in the theories of regional political cooperation. See Yoshikazu Sakamoto, "Toward Global Unity", in Herbert M. Levin, (ed.), World Politics Debated (New York: McGraw-Hill Book Company, 1983), pp. 96-97; Robert L. Downen and Bruce Dickson, (eds.), The Emerging Pacific Community: A Regional Perspective (Boulder, Colorado: Westview Press, 1984.

31. Korea Newsreview, (June 1985), p. 12.

32. Stephane Haggard, "The International Politics of East

Asian Industrialization", Pacific Focus, Vol. 1, No. 1 (Spring 1986), p. 108.

33. Korea Newsreview, (August 1985), p. 21.

34. Hee Yhon Song, "Economic Miracles in Korea", in Lawrence Krause and Sueo Sekiguchi, Economic Interaction in the Pacific Basin (Washington, D.C.: The Brookings Institution, 1980).

35. Construction contracts and trade with the region jumped from nil in 1972 to $9.8 billion and $3.2 billion respectively in 1981.

36. Korea Herald, November 9, 1980. On ties with Africa through France, see World Business Weekly, July 14, 1981; and Machinery Korea, June, 1981.

37. Far Eastern Economic review, June 26 and July 2, 1981.

38. David Yoffie, "The Newly Industrializing Countries and Political Economy of Protectionism", International Studies Quarterly, (December 1981), Vol. 25, No. 4; John O'dell, "Latin American Trade Negotiations with the U.S.", International Organization, (Spring 1980). O'dell shows how specific bargaining tactics can overcome power differences.

CHAPTER FIVE

CONDITIONS OF KOREA'S FOREIGN RESOURCE SUPPLY

The previous chapter described how Korea could expand its foreign trade as a way of enhancing its carrying capacity. It was also revealed in the latter part of the chapter that Korea's increased foreign trade has made its economy sensitive and vulnerable to other countries. The maintenance of a stable foreign trade structure is an important policy component in sustaining the nation's current carrying capacity. The nation's current trade structure has problems such as a chronic deficit, an asymetric pattern in favor of two great powers (Japan and U.S.), a concentration of a limited number of export items, and a consistent pressure of natural resource imports. These problems cannot be treated solely in the context of domestic economic and industrial policies; they have far-reaching implications for Korea's security.

In addition to the security consequences caused by maintaining an unstable foreign trade structure, our main concern with supply security calls for a clear examination of Korea's resource supply conditions. A country may further increase its carrying capacity, if it has buying power to supply more resources from foreign countries. However, economic capability is only one of the policy

components in securing foreign resource supply. A nation's supply security is also determined by many other factors which derive from political, military, and geological conditions.

In this chapter we will examine the current aspects of Korea's resource dependence as a way of understanding the nation's supply security. A proposition, with regard to evaluating a nation's supply security, has already been suggested in Chapter Two: the necessary condition of a nation's vulnerability can be expressed in the criticalness of resource dependence; but, of great significance is the varying ability of the nation to cope with supply interruptions. In other words, the sufficient condition of a nation's vulnerability lies in the weakness of its domestic coping mechanism. The purpose of this chapter is to assess Korea's resource dependence in selected commodities in terms of supply security concern.

Measure of Dependence

The effort to measure a nation's dependence on foreign natural resources is not easy. It is often suggested that a simple effort to indicate a nation's dependence on foreign resources (e.g., import percentage of total consumption) is meaningful enough to denote its vulnerability on the grounds that it is ultimately uncontrollable in the importer's own terms.[1] But, this point cannot lead to the preference of

autarky in the policy-making process. The preference of such an extreme case is not valuable in the current environment for the following reasons: 1) It is not possible to identify a nation which can be sustained only within its own resource base; 2) The benefit of economic exchanges among nations is simply greater than that of autarky. It should also be recognized that an appeal from such a simple measurement may distort reality. For example, Korea's dependence on bauxite is extremely serious in terms of figures calculated from its import percentage of total consumption. But, its importance to the nation's economy and survival is minimal. If we consider its availability in terms of global reserves, number of exporting countries and their friendliness to Korea, then, Korea's dependence on bauxite may not be critical. In other words, it is not enough to depend on any one measure in denoting the criticalness of resource dependence. This rationale leads to an important question, How do we assess the phenomenon of resource dependence in terms of security?

Since supply security involves careful consideration of various threats, responses, and both short-term and long-term effects, no single or simple measure of dependence can suffice. The difficulty is to devise a measurement strategy that avoids either becoming just a "laundry list" (which is converted to a single index by equal weighting of all elements) or producing the appearance of precision where the reality is utterly absent. The result will necessarily

be a multidimensional measure of dependence, but we can combine some elements and suggest circumstances under which particular elements may be important.[2] This study is concerned with identifying some elements that constitute necessary, if not sufficient, conditions of resource dependence.

1. The most common measure of dependence is the imports of a commodity as a percentage of a country's total consumption of that commodity. Using this measure, we can quickly accumulate a substantial list of commodities on which a nation is dependent. There may be a long list for European countries, Japan, and Asian NICs. But, this measure says nothing about the importance of each commodity to a nation's economy, and other conditions to mitigate or deepen such a dependence.

2. One crude way to count the matter of importance is to measure the value of imports of the commodity as a percentage of the nation's gross national product. This measure will implicitly help the understanding of the criticalness of a commodity to a nation's economy. An importer may choose among many possible suppliers of a commodity, in a reasonably competitive market. In such a condition, the importer can hardly be characterized as dependent in a politically or economically meaningful way, since the costs of such dependence can be minimized.

3. There can be a measure of the lack of diversity for an importing nation. Better than the measure of a percentage imported from the largest supplier is a measure that takes into account the relative importance of several major suppliers. Two classic instances, the Hirschman's index of concentration; and Ray and Singer's index to measure the concentration of power in the international system, are useful.[3] This study depends on Hirschman's index to measure the concentration of suppliers. If the imports of a nation from the other nations are expressed as percentages of its total imports of a commodity, then the index is obtained by forming the sum of the squares of these percentages and by extracting the square root of this sum. For example, when a nation's trade is completely monopolized by another nation, the value of the index is 100. The index would assume the value of zero if a nation trades with an infinite number of countries possessing each an infinitely small share in the trade of the nation.[4]

4. Another information gained from using the Hirschman's statistical formula is a type of market condition. We can calculate how a commodity is distributed among exporting countries. This measure of concentration by exporting countries gives some indication of relative supply elasticity. If many countries export in a relatively equal amount, then the index would be close to zero, as expressed

previously. If the index approaches 100, we may infer that the market is monopolized by a small number of countries.

5. The availability of the current supply of a commodity can be crudely measured by worldwide reserves. Reserves are a function of geological conditions, information about mineral deposits, technology, and price. Technological developments, such as new recovery techniques or deep-sea mining procedures, can make economically accessible reserves of what previously had been unexploitable deposits. Thus, it may be inaccurate to depend on the reserves estimated in the current development. With this point in mind, we will carefully interpret resulting outcomes.

6. Reliability of current suppliers should be taken into account. Dependence of a resource commodity available from only one or a few suppliers will be serious only if those suppliers are regarded as unreliable. No source is usually deemed as reliable as one within the boundaries of a nation's own resource base, but neighbors may be regarded as good enough. One crude idea to measure the reliability of the current supplies is to take into account the political and diplomatic relationship between exporting and importing countries. Another important measure is to look at the political stability of suppliers. A supplier may be presently friendly and reliable, but its long-term future

may be in considerable doubt. In other words, a supplier that is unable to preserve sufficient domestic political stability to maintain supplies poses a threat.[5] In so doing, we use a scale from 1 to 5. The higher the scale rating the more likely a supply-cut for political reasons.

7. The last measure is concerned with the "cartel proneness" of a commodity-market. Even if not seen as hostile or politically unstable, foreign suppliers may be regarded as likely to engage in cartel behavior: not denying supplies of an important resource but raising its price substantially. A cartel aims not to cut off sales to a particular customer entirely but to raise prices. We also use scale from 1 to 5, as applied in the previouscase (the measurement six).

Illustration of Korea's Resource Dependence

We have selected eight commodities from the three broad natural resources (food, energy, and non-fuel minerals) to illustrate the varying relationships among these different components. Although Korea's list of imported resources is much longer than this, this study concentrate on eight commodities for the sake of convenience. They are wheat, corn, soybean, coal, petroleum, iron ore, cooper, and aluminum. These commodities are distinguished in Korea for growing demands and domestic shortages. The data in Table

5-1 are sometimes approximate but are reasonably accurate for the years 1963-64, 1973-74, and 1983-84.

By the first measure, imports as a percentage of consumption, Korea's dependence on the selected resources with the exception of coal and soybean is serious, since more than 90 percent of each commodity is currently imported. If we look at the changing pattern of supply, it is clear that the self-sufficiency of all resources has been significantly reduced over the last two decades. Korea's difficulty is shown in the supply of petroleum and aluminum the most clearly, since they are not found in the nation's resource base. In the case of petroleum, the Korean government has eagerly tried to find any oil and gas bed within its territories, but no reserve has been reported.[6]

Table 5-1

Korea has some reserves of iron and copper ore, but their usefulness is limited. It is too costly to produce the resources because of bad geological conditions. The production of iron ore has remained constant at the level of the early 1970s. Even more serious is the production of copper ore. The level of copper production in 1984 remained at only 20 percent of that of 1975. By contrast, the

Table 5-1: Some Aspects of Korea's Dependence on Selected Natural Resources (1963/64)

	Wheat	Corn	Soybean	Coal	Petroleum	Iron Ore	Copper	Alumi-num
1. Imports as % of Consumption	78.1	76.2	5.5	1.7	100	0	12.9	100
2. Imports as % of GNP	1.4	0.1	0.03	0.01	0.9	0	0.05	0.06
3. Concentration of Import Suppliers (Hirschman's index)	92.8	100	100	57.9	100	0	100	64.8
4. Concentration of Countries by Exports (Hirschman's index)	50.6	58.6	70.1	48.4	38.6	32.2	47.7	32.9
5. Likelihood of Global Scarcity (available years)	---	---	---	2427	33	57	42	175
6. Reliability of Suppliers(on scale 1-5)								
a) Hostility	2	2	2	2	2	---	2	2
b) Political Stability	1	1	1	1	3	---	1	1
7. Cartel Proness	2	2	2	1	2	1	1	1

Table 5-1 (continued) : 1973/74

	Wheat	Corn	Soybean	Coal	Petroleum	Iron Ore	Copper	Alumi-num
1. Imports as % of Consumption	95.1	89.7	15.5	6.9	100	69.1	57.2	100
2. Imports as % of GNP	1.6	0.4	0.1	0.5	5.5	0.3	0.5	0.2
3. Concentration of Import Suppliers (Hirschman's index)	99.7	74.6	100	63.1	69.2	59.8	70.1	62.5
4. Concentration of Countries by Exports (Hirschman's index)	68.5	62.2	58.1	33.7	30.6	30.1	37.4	40.1
5. Likelihood of Global Scarcity (available years)	---	---	---	267	32	181	56	246
6. Reliability of Suppliers(on scale of 1-5)								
a) Hostility	2	2	2	2	3	3	2	2
b) Political Stability	1	1	1	1	3	2	1	1
7. Cartel Proness (1-5)	2	2	2	1	5	3	3	3

Table 5-1 (continued): 1983/84

	Wheat	Corn	Soybean	Coal	Petro-leum	Iron Ore	Copper	Alumi-num
1. Imports as % of Consumption	97.3	96.6	75.5	35.0	100	96.0	99.4	100
2. Imports as % of GNP	0.5	0.8	0.3	0.9	7.4	1.8	0.4	0.4
3. Concentration of Import Suppliers(Hirschman's index)	99.1	97.0	99.0	47.9	40.0	52.0	33.7	67.4
4. Concentration of Countries by Exports (Hirschman's index)	48.9	64.5	78.2	50.3	32.0	39.1	41.3	47.3
5. Global Scarcity (available years)	---	---	---	172	34	315	65	275
6. Reliability of Suppliers(on scale of 1-5)								
a) Hostility	2	2	2	2	4	3	3	2
b) Political Stability	1	1	1	1	3	2	2	1
7. Cartel Proness	2	2	2	1	4	2	2	2

Sources: Economic Planning Board, Major Statistics of Korean Economy (Seoul, 1985); Office of Customs Administration, Statistical Yearbook of Foreign Trade (Seoul, 1985); United Nations, 1983 International Trade Statistics Yearbook, 1984; Commodity Research Bureau, CRB Commodity Yearbook (New Jersey, 1985); Hargreaves and S. Fromson, World Index of Strategic Minerals (New York: Facts on File Inc., 1983); World Oil, 1980-1985; United Nations, Commodity Trade Statistics, 1984; United Nations, Yearbook of World Energy Statistics, 1979-1985; U.S. Bureau of Mines, Mineral Yearbook, 1965, 1975/ Mineral Facts and Problems, 1965, 1975 edition.

demands of the resources have dramatically increased since the early 1960s. As a result, domestic supplies of the resources are almost negligible, as compared with the nation's current consumption.

The main reason for the decreasing self-sufficiency of grain products is mainly due to the peoples' changing dietary pattern. Rice has long been treated as the main source of food in Korea. This pattern has changed to increase the consumption of meats and other Western food, which is not sufficiently supplied by the nation's agricultural capacity. Although the production of the three grains --- wheat, corn, and soybean --- has steadily increased, the consumption of the grains as a source of feeding live-stock has grown dramatically. Korea is almost self-sufficient in rice, but other grains are now in significant shortages. As a result, the self-sufficiency of the total grains dropped from 94 percent in 1965 to 50 percent in 1984.[7]

The dependence of coal is much more critical than the figure estimated in the table. Korea's production of coal is limited to anthracite coal which is mainly consumed by households. There exists little bituminous coal, one of the most indispensable fuels for modern industry. Korea's imports of coal are concentrated on bituminous coal to meet its industrial consumption. In 1984, the share of bituminous coal imports to the total coal imports was more than 90 percent. As the government attempts to reduce

dependence on petroleum, the demand for foreign coal will be increasing.

The importance of imported commodities to Korea's economy is exemplified in the case of petroleum. Expenditures on petroleum are now much higher than the defense expenditures which reach 6 percent of the GNP. It is also obvious that the significance of imported petroleum to the nation's economy has risen remarkably. The resulting vulnerability was already manifested by a supply instability. Korea experienced a severe economic recession and inflation in the wake of the second oil shock during which world oil prices sky-rocketed. This economic instability in turn triggered extensive hostile demonstrations from the Korean people that were a decisive factor in toppling the 17 year authoritarian regime.[8] Aside from the financial significance of the imported petroleum, its importance to Korea's energy security is much more serious, because the country's dependence on petroleum for its total energy consumption is more than 60 percent. Thus, any threat to oil supply will be disastrous to Korea's economic security.

The most important resource among non-fuel minerals is iron ore, which is second in significance to the nation's economy. As a way of deepening its industrial structure, since the early 1970s the Korean government has placed its policy priority to the construction of a petrochemical plant and integrated steel mill. As a result, there have been successes under the project, such as the highly efficient

state-owned Pohang Iron and Steel Company, possibly the most efficient integrated steelmaking facility in the world. The construction of this ambitious steel mill has begun to increase the imports of iron ore.[9] The total production of iron and steel has undergone a remarkable increase from 140,000 metric tons in 1962 to 8.5 million tons in 1982. This trend will be continuing further as the iron and steel products are consumed by the automobile, machinery and other industries. In particular, Korea made its first passenger car shipments to Canada in 1983. The nation's car export market expanded to such European countries as Britain, the Netherlands and Belgium, continuing its entry into the U.S. market in 1986. As a result, car exports in 1984 amounted to more than 50,000 units, twice as large as in 1983.[10] To meet theses increasing demands of iron and steel products, the government began to construct a new steel mill called the Kwangyang Iron and Steel Mill, which will be capable of producing 2.7 million tons of crude steel when the construction is completed in March 1988. The importance of iron ore to Korea's economy is examplified by the weight of steel products in the country's exports; in 1984, their share in the nation's total exports was approximately 10 percent.[11]

Two other commodities, corn and coal, reached almost 1 percent of the GNP in 1984, which is much more moderate than that of petroleum. Their importance to the nation's economy has also increased since the early 1960s. The dependence on

corn would be less vulnerable to any supply interruption, since corn can be easily substituted for other similar grains like wheat, barley, and soybean. It may be also possible to substitute corn for imports of live-stocks, since corn is mainly consumed as a source of feed stuffs. Coal can be substituted for other energy resources, but it will be much costlier than in the case of corn substitution. The significance of coal to the nation is further increased by the energy policy of the government: To reduce the dependence on petroleum, the Korean government has increased the consumption of coal since the second oil shock.[12]

The importance of copper and aluminum to Korea's economy is less than that of iron ore. However, the demands of these resources are notably rising, as the country's economic structure has begun to further specialize in heavy industrial sector. The nation's industrial deepening has been reflected in the structure of exports. As seen in Chapter Four, the share of heavy and chemical industrial products increased 29.5 percent in 1975 to 56.8 percent in 1984. This change has increased foreign supplies of strategic raw materials. Of significance is that these resources are heavily deficient in the nation's resource base. Copper is widely used in home wiring, in electrical power transmission, and in communication systems. It is also used in a broad range of alloys, and is the basis for brass and bronze. Because copper has a unique set of important properties, no other resources can be effectively

substituted for copper. For example, aluminum or iron is being substituted in high-power transmission lines but neither material is as effective as copper. In particular, there are few practical substitutes for copper in electric motors, where heat is an important limiting factor.[13] Korea's annual demand of copper ore has increased 18 thousand M/T in 1971 to 350 thousand M/T in 1984. The demand of copper ore has not increased in the last four years.

While aluminum occurs as a metallic element in nature, commercial production is mainly achieved through refining bauxite ore into alumina, which is then reduced electrolytically into aluminum. It is used extensively in the construction, the aircraft, and the automobile industries in applications where the rigidity of steel is not necessary. Korea's demand for aluminum has notably increased since 1978 with an annual average growth rate of 40 percent. This rapid growth is attributable to the development of the automobile industry which consumes much aluminum for lighter, energy-efficient vehicles.

As for the geographical distribution of resource supplies, Korea is dependent upon a few countries for grain supplies. The United States has been a major supplier of wheat, soybean, and corn. Korea has imported more than 90 percent of the total imported wheat from the United States. Other suppliers such as Canada, Australia, and New Zealand have always shared a small amount. Even in the case of corn

which has a lowest index for supplier concentration in food grains, the share of other suppliers like Argentina and Tailand is almost negligible, remaining 3 percent of the total imports in the period of 1983-84. It is also found that Korea's dependence of grain supplies on U.S. market has not been reduced over the last two decades. This monopolistic position of the United States can be a source of supply threats for Korea. A threat of supply cut from the United States can cause Korea severe damage, while it will only be a matter of adjustment in the export markets for the United States.

Korea's heavy dependence on the United States for grain supplies has resulted from the nation's consistent export expansion to U.S. markets. As already seen in the previous chapter, the United States has been the main export markets for Korea's manufactured products. To strike a balance of trade with the United States, Korea had to import more U.S. export products. Among many items that the United States can export, grains are major export items. The United States is also a monopolistic exporter in world grain markets, while Korea has had shortages in food and feed grain supplies. This condition has contributed to the development of Korea's current pattern of grain imports.

Table 5-2

Table 5-2: Major Suppliers for Korea's Resource Imports (1983/84)

Commodities	Imports as % of Consumption	Major Suppliers (%)
Petroleum	100	Saudi Arabia(31), Iran(16), Kuwait (11), Oman(9), Malaysia(5), Indonesia(5)
Aluminum	100	Guyana(1.6), Japan(23.2), Hong Kong (12.2), Australia(62.1)
Copper	99.4	U.S.(2.1), Brazil(2.5), Chile(12.5), Mexico(18.1), India(2.4), Indonesia (4.6), Papua New Guin(12)
Wheat	97.3	U.S.(99), New Zealand(1)
Corn	96.6	U.S.(97), Argentina(1), Thailand(2)
Iron Ore	96.0	Australia(38), India(24), Brazil(20), Peru(18)
Soybean	75.5	U.S.(99)
Coal	35.0	Australia(33), U.S.(18), Canada(24), China(6)

Source: United Nations, Commodity Trade Statistics 1984.

Another commodity that has lacked a diversity of suppliers is aluminum. Korea has imported aluminum in the form of refined product (alumina). The lack of technology and electricity made Korea dependent on suppliers which can produce refined aluminum. Korea doesn't have refining facilities to produce alumina from bauxite, not to speak of bauxite reserves. As a result, the Western developed countries such as Japan, Canada, and Australia have been the main suppliers of aluminum for Korea. In the 1984 statistics, Australia shares more than 60 percent of the Korea's total aluminum imports.

Copper has the lowest figure of all commodities in terms of the concentration of suppliers in the period of 1983-84. Until the mid-1970s, Korea imported most of its copper from Japan in the form of refined product, since domestic production of electric copper couldn't come up to rising consumption. As the nation began to increase its capacity to produce electric copper, the import pattern of copper has changed to a dependence on countries producing copper ore. In 1984, Korea imported copper ore and its refined product from almost 10 countries, indicating a better posture than the past two periods in diversification of suppliers.

Korea's imports of iron ore are relatively well distributed among four major suppliers, such as Australia, India, Brazil, and Peru, sharing almost equal amounts. It is obvious that Korea has deliberately pursued the

diversification of suppliers for iron ore, since the index of 1983-84 shows a lower figure as compared with that of 1973-74. The appearance of Brazil as a new supplier has kept Korea in better condition.

The suppliers of the two energy commodities, petroleum and coal, are distributed fairly equally among many countries as compared to other commodities. The indexes for the two commodities show less likehood of supplier monopoly in the 1983-84 table. The coal providers are the United States (18.2%), Australia (32.7%), Canada (23.6%), and others, mainly Britain and China. At the same time, the major providers of petroleum are now more than ten countries. It is clearly indicated that the Korean government has diversified oil suppliers over the last two decades. Although the index for petroleum doesn't show any serious problem of supplier diversity, a consideration of other factor such as political conditions may overshadow the implication of the index. For example, Korea's oil dependence on OPEC reaches 70 percent of the total imports. This means also that Korea is severly dependent on Middle East for its oil supply. But, it is no doubt Korea has actively pursued the diversification of suppliers. The indexes for coal and petroleum have successively declined. Until the second oil shock, Korea was dependent on three countries, such as Kuwait, Saudi Arabia, and Iran for its oil imports. Since the late 1970s, the nation has attempted to develop new suppliers especially in Southeast Asia and

Latin America.

The index for the concentration of exporting countries is helpful to see a possibility for importing countries to further diversify their suppliers. In general, food-grain exports are limited to a few countries. The indexes for soybean and corn are relatively high, since export markets of the two grains have been dominated by the United States whose share has always been more than 50 percent of the world total. It should be pointed out that the share of the United States has been steadily increasing over the last two decades. For example, the share of U.S. corn exports increased from 55 percent in the period of 1963-64 to 60 percent in the second period and 62 percent in the last period. The same trend can be found in the case of soybean. The second largest exporter of corn has been Argentina which has taken about 10 percent or more in world market. Other exporting countries of corn in the latest period are Australia, Thailand, and Canada, but their shares are small. In addition, the export market of soybean is highly concentrated on the United States. The share of U.S. export is almost 80 percent of the world total. Argentina and Brazil share the remaining 20 percent of the market.

The export market of wheat is more favorable to importing countries than corn and soybean in its distribution. The United States also dominates the market, exporting 37 percent of the world total exports. Canada is the second largest exporter (22%), and EC, Australia and

Argentina share about 10 percent each of the export market. The share of the United States has steadily decreased, while Argentina, Canada, and Western European countries have increased their shares in world total exports. This trend resulted in a lower index for the concentration of export countries.

Table 5-3

These conditions in the world grain markets may indicate that Korea's effort to diversify its grain suppliers is limited. However, the possibility for Korea to diversify its grain suppliers does exist in world grain markets. The nation's small share of world imports makes it possible to approach smaller exporters in the markets. Korea's import share of world grain markets is insignificant, taking only 4 percent or more. In 1984, for example, Korea spent about 600 million dollars to import corn, but this amount was only 4.2 percent of the world total value of exports in corn trade, and about 6 percent of the total U.S. corn exports. In fact, the chance to diversify its suppliers is restrained by other conditions. Korea's balance of trade with the United States has had a significant surplus since the early 1980s. Any effort to reduce its imports from the country would deepen this trade imbalance, thereby triggering trade

Table 5-3: Major Exporting Countries of Selected Commodities(1983/84)

Commodities	Major Exporting Countries
Wheat	U.S.(38), EC(15), Canada(22), Australia(11), Argentina(11)
Soybean	U.S.(77), Argentina(11), Brazil(6)
Corn	U.S.(62), Argentina(15), Thailand(3), Canada (8), Australia(4)
Petroleum	Saudi Arabia(24), UK(8), Nigeria(6), UAE(7), Lybia(5), Indonesia(6), Iran(9), Iraq(4), Mexico(8), Venezuela(3), Norway(3), Algeria(3)
Coal	U.S.(38), Australia(28), South Africa(10), West Germany(9), Canada(10), UK(3)
Iron Ore	Brazil(27), Australia(22), Canada(12), India(7) Liberia(6), Sweden(4), South Africa(4), Chile (3), U.S.(3)
Copper	Chile(16), Germany(12), Belgium(8), Zambia(7), Japan(8), Zaire(5), Canada(6), France(5)
Aluminum	West Germany(12), U.S.(8), Canada(11), Norway (8), France(7), Netheland(7)

Sources: United Nations, 1983 International Trade Statistics Yearbook, 1985 ; Commodity Research Bureau, 1985 Commodity Yearbook, 1985; FAO, Commodity Review and Outlook 1984-85.

conflicts between the two countries.[14] In other words, the condition of world grain markets in terms of the distribution of exporting countries is not a main factor for Korea's complete dependence on the United States for its grain supplies.

Energy commodities are well distributed in their export markets. Specifically, Table 5-1 indicates that petroleum has been more favorable than coal in the concentration of exporters. The United States and Australia are major exporters of coal, sharing 38 percent and 23 percent of the world total respectively. Another three countries, such as West Germany, South Africa, and Canada share 10 percent respectively. As for the oil market, exporters are presently distributed among many countries, reaching almost 20 in number. Among them, Saudi Arabia is a leading country in oil exports, and its share of the market is 24percent. Five other countries, UAE, Indonesia, Britain, Mexico, and Iran compose the second tier, exporting approximately 7 percent each. Thus, there are plenty of options for energy importers concerning supplier diversification in the world markets.

However, if we look at the distribution of the two energy resources in terms of political and geographical considerations, coal reserves are somewhat more evenly and favorably distributed than oil reserves for Korea. Western developed countries such as the United States, Canada, Australia, Germany, and England are endowed with 47 percent

of world technically and economically recoverable reserves of coal. The Communist countries and other developing countries account, respectively, for 39 percent and 15 percent of total coal reserves.[15] By contrast, the geographical distribution of proven reserves of oil is heavily concentrated in OPEC with the percentage of 67. Three other geopolitical regions, Western developed, Communist, and other developing regions, share about 10 percent respectively. In addition, four countries, Saudi Arabia, Kuwait, the Soviet Union and Iran, account for 55 percent of the world's proven oil reserves; The ten leading countries in proven oil reserves own 82 percent of these reserves.[16] Consequently, the condition of coal supply is more easily accessable than oil for such an industrializing country like Korea.

The condition of non-fuel minerals is generally favorable for importing countries. The major exporters of iron ore are Brazil and Australia. These two countries now export almost 50 percent of the world total. The share of the second largest group, including Canada, India, and Liberia, is 30 percent of the market; the remaining 20 percent is shared by Sweden, South Africa, Chile, Philiphines, Peru, Venezuela, and the United States.

Copper is found on every continent in the form of sulfide, oxide and carbonate compounds. In the Western hemisphere, major mining operations are located in the United States, Canada, Chile and Peru. Mining operations in

Zaire and Zambia, worked since the 1930s, are additional important sources. On the other hand, exporters of refined copper are mainly western developed countries like West Germany, Japan, Belgium, Canada, Chile, and France.

As for aluminum, Australia, Guinea and Jamaica are the three largest world bauxite producers. While aluminum occurs as a metallic element in nature, commercial production is achieved through refining bauxite ore into alumina, which is then reduced electrically into aluminum. Primary aluminum production capacity is concentrated in North America, Europe Japan, and Australia, with major developing industries like Brazil. The major exporters of aluminum are West Germany, the United States, Canada, Norway, Japan, France, and the Netherlands. Thus, there is a possibility to diversify suppliers for importing countries in the markets of non-fuel minerals and their products.

The availability of a given resource at the global level may be estimated by dividing total reserves by the current consumption. As mentioned in the beginning of this chapter, the results from this calculation may be misleading. Reserves by definition include only those minerals contained in known deposits that are profitable to mine under existing legal, economic, and technological conditions, and so are not fixed stocks.[17] Thus, our data need to be interpreted with caution, especially for the resources appeared in shortages at hand. As Table 5-1 indicates, aluminum (measured by the bauxite reserves), iron ore, and coal will

be in abundant supply in the future. Moreover, the proven reserves of iron ore and bauxite have significantly increased over the last two decades. There is little reason to worry about the need for substitutes of these three commodities from a geological point of view.

By contrast, two other commodities, petroleum and copper, are not found abundantly through the earth's crust. The availability of petroleum is in the most critical of all resources, since its consumption could last as little as 30 years. Present proven world reserves, about 693 billion barrels in 1984, will last about 34 years at the 1984 world production of 20 billion barrels.[18] If the world continues to use more crude oil at the average growth rate which has prevailed in recent years, present proven reserves could be exhausted in less than 35 years. The situation is aggravated by the fact that, in past decades, the rate of discovery of crude oil relative to production has been constantly falling and was below the rate of production for several years during the 1970s. There has been, however, a slight recovery from 1980. It is fair to say that in the current recession the R/P ratio is holding its own. This is also due to substantial growth in oil reserves from enhanced recovery following the 1979/1980 oil price increases. A return to growth in world oil consumption is likely to result in a long-term decline in the R/P ratio. The evolution of the discovery to production ratio in past decades (Table 5-4) clearly indicates that discovery rates

have been falling steadily, and suggests that in the future they could be lower than the past average.

Table 5-4

One reason for this decline is that the most promising areas have already been thoroughly explored. Exploration technology made great strides in the 1950s and 1960s so that the locations of sedimentary basins are now known far more accurately than they were 25 years ago, and the areas where oil might still remain to be found have been narrowed down. Similarly there is now a much better understanding of the process by which oil is formed and trapped in sedimentary basins. As drilling in basins deeper than about 5,000 meters has proved largely disappointing so far, the oil industry has become far less sanguine about finding commercial deposits of oil beneath the deep ocean bed during the last 5-10 years.[19]

No reasonable substitute for petroleum is available when considering efficiency, safety, and cost. For example, copper can be substituted by other materials (aluminum and iron for copper), even though neither materials are as effective as copper. But, alternatives for petroleum such as coal, nuclear energy, gas, and solar energy are not totally replaceable for petroleum at the current stage.

Table 5-4: Trend of World Oil Discovery and Production (million metric tons)

Time Period	Average Annual Production	Average Annual Discovery*	Discovery/ Production Ratio
1950-1959	745.1	3831.0	5.14
1959-1969	1475.2	4363.8	2.96
1969-1979	2751.8	4015.1	1.46
1976-1980	3070.4	2792.8	0.91
1980-1984	2742.9	3251.5	1.19

* Yearly average of reserve addition plus production during the period.

Sources: For the period of 1950-1980; IEA, World Energy Outlook (Paris: OECD, 1982), p. 207; For the period of 1980-84, World Oil, 1980-1985.

Natural gas may be replaceable for a short time, but its availability would be much shorter than expected at present. Proven gas reserves in 1984 are expected to last about 58 years.[20] Although there has been substantial growth in gas reserves, world consumption of gas has significantly increased with an annual average rate of 6.5 percent during the period of 1960-80. As International Energy Agency analyzed, proven gas reserve additions are still larger than world gas production. This condition will be upset in the near future, largely because of a rapid increase in production.[21] It should be also pointed out that nearly 40 percent of natural gas reserves are associated with petroleum reserves.[22] There are large variations, from 5 percent in the Communist regions to 51 percent in OPEC. The volume of associated gas production is dependent upon oil production levels. This means that countries associated with Western world will face the problems of gas depletion earlier than calculated above. In other words, natural gas can be an alternative to petroleum, but it cannot be the ultimate solution to depletion problems especially for Western world.

Coal may be a reasonable solution to global energy shortages. The use of coal bears costly effects derived from its environmental pollution problems.[23] Coal can only be used in some limited fields, particularly in the generation of electricity; it cannot replace oil and natural gas in many applications. Other alternatives such as

nuclear and solar energy are too costly or risky. In short, although it is not totally pessimistic to think of alternatives for petroleum, a serious effort to secure energy supplies will draw much attention to the issue of national security especially in energy importing countries.

The availability of food-grains may not be easily measured in the same way as energy and non-fuel minerals. However, there have been many concerns about food availability in relation to population growth at least since Malthus argued that food production grows arithmetically while population grows geometrically. Among the most highly respected forecasts are those of the U.S. Department of Agriculture. If correct, these forecasts would mean that between now and the end of the century global food production will grow slightly faster than population, although quite a bit slower than the 1945-81 rate.[24] Perhaps, the most contrasting example can be cited from the two forecasts --- the Limits to Growth report and to The Next 2000 Years for longer-term forecasts. The meadows team predicts that world food production at the end of the next century is only about twice current levels. In contrast, Herman Kahn's projection shows something closer to an eightfold increase by the year 2100.[25]

Discussion of the foregoing issue may be less useful in understanding our interest of food-grains in the international market. Grain trade has been growing very rapidly, more than doubling in volume over the last decade.

Although exporters are concentrated in a few countries, the United States, Canada, Australia, New Zealand, Brazil, and Argentina, importers have increased, including many countries from the Third World. All LDC regions shifted from balanced, or net exporter, status to net importer status by the late 1970s.[26] The most significant changes in the 1970s were the entry of Africa the USSR, and Eastern Europe into the global market in major volume, supported by an expansion of the United States exports.[27] There has been no indication for shortages in grain supplies in world markets. Developing countries are clearly situated to increase their supplies of food grains from foreign countries. Despite their shortages in grain supplies, most developing countries lack financial ability to buy foreign grains. This condition has often kept exporters under pressure to search for importers. In fact, the United States, a monopolistic exporter of grains, has often faced with surplus grains, and surplus disposal has been an important objective for government. However, the growing number of importers can be a brake for the current favorable condition of grain supplies in the long-term basis.

The sixth measure is to see how a country's supplies of resources are vulnerable to sudden threats from suppliers for political reasons. Major suppliers for Korea's food-grains are mainly from the United States and a few countries such as New Zealand, Argentina, and Thailand which are on good political terms with Korea. These suppliers may

interrupt supplies to Korea. Even the United states which holds a commitment to Korea's military security may still interrupt food-grain supplies to Korea for various reasons. It may use such a monopolistic position as a bargaining chip to influence Korea toward its own terms in other issues.[28] It is not realistic, therefore, to assign a scale 1, which implies a "highly unlikely" for the possibility of supply interruption. Such a lowest scale may be assigned to the Western European community that is bound by strong friendship.

We assign a relatively higher scale for petroleum since suppliers of the resource are mainly from developing countries, especially from Middle East. Korea has tried to broaden its diplomatic ties with the Third World countries over the last two decades. The nation's earlier diplomatic principle characterized by anti-Communism has steadily changed to a more neutral position, finally proclaiming in the early 1970s that it is ready to interact with Communist countries with regard to economic, cultural, and other non-political dimensions.[29] This changed principle in diplomatic posture has helped Korea to enhance its status and image especially to other developing countries. Although Korea's interactions with developing countries have steadily grown, the interdependence is still less stable than that of developed countries in the sense that North Korea's attempts to interrupt South Korea's economic interests is still likely. In addition, the United States'

hegemonic control of the Third World regions has steadily deteriorated, while the Soviet expansionism has been relatively active in the regions. Thus, the dependence on the Third World countries for resource supplies cannot be considered a secure pattern for Korea. Korea's dependence of Middle East for its oil supplies is further signified by a growing doubt of the reliability of suppliers. Korea had long depended on Western major oil companies for its oil supplies until the mid- 1970s. The proclamation of resource nationalism by the Middle Eastern countries resulted in a complete retreatment of major companies from Korea. Now, Korea has to supply its oil directly from producing countries.

On the other hand, the geopolitical developments surrounding the Middle East have deepened the concern of Western countries for their oil supplies. The two superpowers, the United States and Soviet Union, are ultimately tied to energy resource-poor allies, although they have the theoretical capacity for energy self-sufficiency. In the short term, even the superpowers will face their own serious energy difficulties. Their immediate task is to prevent these from germinating into full-blown confrontations over external energy resources in volatile areas like the Persian Gulf. Consequently, the Middle East has become a strategic objective for the two superpowers. For Korea, this development means that its oil supplies from Middle East are conditioned by the

controllability the United States has over the Middle East.

Furthermore, regional political developments in the Middle East further weaken the reliability of Middle East suppliers. The Lebanon crisis, the Iran-Iraq war, and domestic political instabilities stimulated by revolutionary insurgencies are likely to endanger the secure flow of oil. The other possibility of supply interruption for Korea is originated from the nation's rivalry with its own enemy, North Korea. North Korea's diplomatic activities in the Middle East have been widely spread to strategically interrupt South Korea's economic involvements in the regions. In short, Korea's dependence of oil supplies on the Middle East is considered risky in terms of the reliability of its suppliers.

For the same reasons, copper and iron ore are assigned the scale of 3, which is lower than petroleum, but higher than other commodities. Korea imports more than 60 percent of its iron ore supplies from developing countries, such as India, Brazil, and Peru. The suppliers for the nation's copper are mainly developing countries such as Brazil, Chile, Mexico, India, Indonesia, and Papua New Guin, which share almost 80 percent of its copper imports. In particular, the index of the latest period increased one scale higher than that of the previous periods. The reason is that the pattern of the nation's dependence has changed by its direct imports from copper ore producing countries. Until the second period, 1973-74, Korea imported its copper

from Japan, the United States, and West Germany.

Two remaining commodities, aluminum and coal, are assigned with the scale of 2 as in the case of food-grains. Major suppliers for them are western developed countries. In the case of coal, Korea imports a little from China. No formal relationship between the two countries has been established yet. For this reason, Korea's imports of coal from China are extremely vulnerable to the latter's sudden cut. But, the amount of the imports is almost negligible as compared to the total imports; they share only 6 percent. Aluminum is imported from Japan, the United States, Canada, and Australia which have good relationships with Korea.

If we look at the political stability of suppliers to support the measurement of the reliability of suppliers, the petroleum profile is distinguished by its relatively higher scale. Most of Middle Eastern countries face the possibility of current regimes being toppled by political uprisings. Saudi Arabia is the most stable regime in the region, but other countries such as Iran, Oman, and Kuwait are considered instable because of ethnic-separatist movements and related internal-revolutionary insurgencies or guerrilla movements.

The final concern is to consider the likelihood of a sudden and large price increase in a given commodity market. We assume here that the emergence of a cartel in a market is likely to stimulate such a large price increase. But, cartel proness is difficult to judge since it depends on

various factors which are derived from political, economic, and properties of each commodity.[30]

We attempt to roughly assign a scale to each commodity market for the sake of simplicity. OPEC is surely the most successful major commodity cartel so far, although it has looked rather shaky in recent years. By comparison, the International Bauxite Association (IBA) has achieved only a moderate success, as might be inferred from the diversity of its producer countries. The Association of Iron Ore Exporting Countries (AIOEC) and the Council of Copper Exporting Countries (CIPEC) have remained as a friendly organization. The IBA was established in 1974 by seven countries: Australia, Guinea, Guyana, Jamaica, Sierre Leone, Surinam, and Yugoslavia. The members of the organization comprise eleven countries, accounting for 70 percent of world bauxite output. India joined the association in 1983. Haiti resigned at the end of 1982, when it closed its only bauxite mine. The association doubled prices between 1973 and 1976, and has leveled off since then.[31]

The organization of iron ore (AIOEC) was established in 1975 by eleven countries: Algeria, Australia, Brazil, Chile, India, Mauritania, Peru, Sierre Leone, Sweden, Tunisia, and Venezuela. But, it does not give the association any price-fixing power, and the politically diverse participants are bound merely to consult and mutually aid each other. There is little reason to fear any sudden price increase in the market of iron ore.

The organization of copper has also been ineffective in increasing copper prices. The CIPEC formed in 1967 resolved to control the declining price of copper on world markets in 1974. Responding to the sharp drop in prices during the latter half of 1974 and early 1975, members of the CIPEC announced an agreement to restrict their exports by 15 percent.[32] These actions turned out to be far less threatening than they seemed at the time. Realizing their inability to control the volatile price of copper, the producing countries abandoned their efforts to stabilize and raise prices through a producers' cartel, and pushed instead for the formation of a copper commodity agreement under the auspices of the Integrated Program for Commodities of the United Nations Conference on Trade and Development (UNCTAD). A commodity agreement, unlike a cartel, involves the participation of consuming as well as producing states, and concentrates on stablizing rather than raising prices. Despite some favorable conditions from political and market factors, CIPEC has little chance of increasing the price of copper. In the long run, demand for copper from CIPEC is highly elastic. New sources of raw copper are available. One of the most important and potentially threatening sources is from deep-sea nodules. Unless any price increase of copper is relatively modest, new supplies will be developed. Also, unless any increase is limited, substitutes such as aluminum and plastics will be used.[33]

There is little reason to worry about any cartel

formation among exporting countries in the food markets. However, this trend does not lead to a lowest scale rating 1, since there is a similar cartel effect in the markets. The United States has been a predominant actor in the export markets of food-grains. Less attention has been paid to the century-old grain cartel among the five companies in the markets: Cargill, Continental, Bunge, Louis Dreyfus, and Andre. The Big Five are at the center of the global system by which grains are distributed and processed. As Dan Morgan has noted, the real power of these companies is not only determining world food prices but also frustrating attempts by governments to use food as a weapon.[34] In other words, the existence of the major grain companies is not likely to affect the stability of grain supplies per se, but it may result in price manipulation in world grain markets. For this reason, we assign a scale 2, a little higher than coal.

The Profile of Korea's Resource Dependence

All of the data in Table 5-1 would be clearer from further discussion and refinement, but they are sufficient for this study to make some summary points about conceptual clarity and measurement of resource dependence. Seven elements may constitute necessary but not sufficient conditions for an accurate judgement that a country is vulnerable to foreign supplies. In policy terms, it should

be emphasized that not all conditions need to be met to attract concern over supply security, although at least one of them should be met. In summarizing the characteristics of Korea's dependence of foreign natural resources, we use three main scales --- high, medium, and low --- to judge the degree of criticalness in each condition.[35] Table 5-5 was mainly based on the data of the 1983-84 period. However, the final judgement in some conditions may be different from the data, since we also apply a contextual analysis to generate a more reliable judgement.

Table 5-5

Eight commodities in the context of Korea are fairly enough to receive our attention to supply security in the sense that each commodity is assigned with "medium" or "high" at least more than four times. It can be identified from Table 5-5 that the most vulnerable profile of the eight resources is the supply of petroleum. The indexes for the concentration of exporting countries and Korea's import suppliers showed relatively low profiles. Consideration of other conditions, cartel proness and geographical distribution, slightly increase its criticalness to get a medium position in the two conditions. For example, Korea's import dependence on OPEC for oil was almost 80 percent in

Table 5-5: Summary Judgements of Aspects of Korea's Resource Dependence

Conditions	Wheat	Corn	Soybean	Coal	Petroleum	Iron Ore	Copper	Aluminum
1. Import Dependence	H	H	M-H	L-M	H	H	H	H
2. Importance to Economy	M	H	L-M	H	H	H	L-M	M
3. Import Concentration	H	H	H	M	M-H	M	L-M	M-H
4. Export Concentration	L-M	M-H	M-H	M	M	L-M	M	M
5. Global Shortages	M	M	M	M	H	L	H	L
6. Unreliability of Suppliers	L	L	L	L	M-H	M	M	L
7. Cartel Proness	L-M	L-M	L-M	L	M-H	L-M	L-M	L-M

Note: L is low, M medium, and H high.

1984. In contrast to oil, the least alarming profile is attributed to the supply of aluminum and coal which are characterized by "highly critical" in only one condition.

Table 5-5 suggests some policy tasks to further secure Korea's resource supplies. For food-grain supplies, Korea's first task will be to increase its domestic supplies. Korea's heavy dependence of three food-grains is so high that it becomes a big burden for foreign exchanges. The increasing number of importers in international markets validates the rationale to increase domestic production. The possibility of increasing domestic production is not completely inhibited since the grains can grow well in Korea's geographical and climatic conditions.

Another policy concern must be oriented to diversify its suppliers. This option will help Korea make it possible to safely switch its suppliers in cases where the current monopolistic supplier (the United States) unexpectedly cuts its supplies to Korea. The current structure of Korea's trade relationships with the United States may inhibit the implementation of this policy. But, the concern of supply security clearly dictate the need for supplier diversification in the case of grain supplies.

As for energy resources (petroleum and coal), policy options are not easily identifiable since the two commodities are different in the conditions of dependence. However, the most urgent task will lie in a comprehensive attempt for substitution. This task is stressed by the high

likelihood of oil depletion. The direction of substitution may temporarily be possible by increasing coal and gas consumption, since they are relatively in abundant supply. The effort for substitution should also involve an attempt to develop alternative energy sources. Coal and natural gas are not enough to totally substitute oil, because they are also finite in supply.

Secondly, there is a need and room for further diversification of suppliers. Although the problem of import concentration is not as serious as in the case of food-grains, the condition of supplier concentration permits further effort in doing diversification. In particular, Korea must reduce its dependence on OPEC countries further. Korea may search for other suppliers from Asia and Latin America. This need will push Korea to keep its diplomacy in a more flexible position, since many exporters are not in good terms with the Western alliance. Korea's ambiguous position along the North-South axis will dictate a bilateral approach rather than a multilateral one in broadening its diplomatic activity.

As for the non-fuel minerals, an effort to diversify suppliers should be made for copper. The supply of copper receives more attention in this regard by the criticalness of import dependence. In addition, there should be a comprehensive program for strategic stockpiling in both governmental and private level. Such a program will provide a very substantial insurance against supply interruptions or

rapid price increase. Copper and aluminum receive more attention in this regard because of the potential rise in cartel behavior among international markets. The importance of strategic stockpiling must also be extended to other resource fields, grain and energy supplies.

In summary, the conditions of resource dependence are diverse in terms of security concern. Each commodity is characterized by a certain profile which is derived from an analysis of such conditions. As shown above, such a profile involves a set of policy suggestions for the objective of supply security. The examination of Korea's case in the selected eight resources implies that the vulnerability resulting from resource dependence can be minimized by a sensible policy performance in a short-term perspective. Such an argument is attributed most to the supply of oil which has been identified as the most critical profile of the nine commodities in our analysis.

Footnotes

1. Examples of such a mixture of rhetoric and policy suggestions can be found in the followings: Council on Economics and National Security, Strategic Minerals: A Resource Crisis (New York: National Strategy Information Center, 1981); James Arnold Miller et al., eds., The Resource War in 3-D-Dependency Diplomacy Defense (Pittsburgh: World Affairs Council of Pittsburgh, 1981).

2. Bruce Russett's recent effort provides a very useful method to measure resource dependence. Russett uses total 12 measurements to compare 4 different resources in light of the U.S. position. They are 1) imports as % of consumption; 2) concentration of import suppliers; 3) elasticity of supply; 4) imports as % of GNP; 5) government stockpile as % of consumption; 6) recycling as % of consumption; 7) elasticity of demand; 8) criticalness; 9) reliability of foreign sources; 10) hostility of suppliers; 11) instability of supplier regimes; 12) cartel-proness. See Bruce Russett, "Dimensions of Resource Dependence: Some Elements of Rigor in Concept and Policy Analysis", International Organization, Vol. 38, No. 3 (Summer 1984), pp. 481-499. For the same idea, see Hans H. Landsberg and John E. Tilton with Ruth B. Haas, "Nonfuel Minerals", In Paul R. Portney, (ed.), Current Issues in Natural Resource Policy (Washington, D.C.: Resources for the Future, Inc., 1980), pp. 74-116.

3. See Albert O. Hirschman, National Power and the Structure of Foreign Trade (Berkeley: University of California Press, 1965); James Lee Ray and J. David Singer, "Measuring the Concentration of Power in the International System", Sociological Methods and Reserarch, Vol. 1, No. 4 (1973), pp. 403-37.

4. Hirschman explains the derivation of the formula in detail in the Appendix. In using this formula, careful consideration is needed to calculate all supplier nations, including nations involved in "others" which is often expressed with a negligible amount in a statistical expression. However, this study ignores such a detailed calculation for the following reasons; 1) to calculate the accurate weight involved in "others", we have to know all countries included in trade relations. But, the detailed statistics are not available in many cases; 2) the weight that we can calculate from the statistics is usually negligible not to seriously affect a final answer. Thus, we will calculate only the weight of major suppliers.

5. Post-revolutionary Iran's sharp reduction in oil exports in 1979 is a good case in point. This type of threat stemmed less from any deliberate policy choice than from continued social and political chaos.

6. The recent work to develop an oil and gas bed has been attempted in the Sixth mining block, east of Pohang. The Korean Petroleum Development Corp. (PEDCO) is committed to develop the zone independently with only technical aid from foreign oil companies. Three foreign oil companies, Amoco Oil Co., Marathon Petroleum Exploration of the United States, and Premier Exploration Co. of England, had been interested in the oil and gas venture in the mining zone, but they have recently showed reluctance to join the project. Korea Newsreview, August 31, 1985, p. 13.

7. In 1984, the self-sufficiency of each grain was as follows; 101.0 percent for rice, 122.9 for barley, 2.7 for wheat, 3.4 for corn, 24.5 for soybean, and 2.7 for others. Ministry of Agriculture and Fisheries, Annual Statistics of Agriculture (in Korean), 1985.

8. The direct event to cripple down the Park's regime was occurred with the assassination of the President Park by Kim Jae-Kyu, director of the Korean Central Intelligence Agency (KCIA). But, this incidence was obviously triggered by the mass protest demonstrations which were stimulated by economic difficulties. For an explanation of this process, see Young Whan Kihl, Politics and Policies in Divided Korea (Boulder & London: Westview Press, 1984), pp. 75-78.

9. Before the construction of the Pohang Mill, Korea had exported most of its iron ore and also imported iron scrap. After 1973 when the Pohang Mill began to produce, the dependency of iron and steel has been reduced to a negligible amount, increasing export amount. Ministry of Culture and Information, A Handbook of Korea (Seoul, Korea: MCI, 1978), p. 555-556.

10. Korea Annual, 1985, p. 125.

11. In 1984, Korea's major ten export items were textile (24.6%), ships (15.5%), electric commodities (14.4%), steel products (9.7%), footwears (4.9%), metal products (3.8%), synthetic rosins (2.4%), toys and dolls (1.7%), tires (1.6%). Tong-A-Ilbo, Tong-A Annual Statistics, (in Korean), 1985.

12. For example, the government predicted that the share of bituminus coal in the nation's total energy consumption would increase from 12.8 percent in 1983 to 27.8 percent in the year of 2000. Ministry of Energy and Resources, The long-term Perspective and Strategy for Energy Supply toward the Years of 2000 (Seoul, Korea: MER, 1985), p. 235.

13. Dennis Pirages, The New Context for International Relations: Global Ecopolitics (North Scituate, Massachusetts: Duxbury Press, 1978), p. 162.

14. There has been no serious debate about the dependence of food-grains in Korea, nor has there been a supply threat to Korea, like the U.S. embargo of soybeans to Japan in 1972. Rather, the situation has been a reverse story. The U.S. has pressured Korea to import more food-grains from the country. This pressure resulted from Korea's over-penetration into the U.S. market in its exports.

15. If we use data in terms of geological resources, then the Western developed countries accounts for 33 percent of world coal resources, with the Communist countries and other developing countries accounting, respectively, for 64 percent and 3 percent. IEA, World Energy Outlook (Paris: OECD, 1982), p. 286.

16. ibid., p. 206.

17. An alternative is to include all of a mineral commodity found in the earth's crust, regardless of whether it is in a known deposit or profitable to recover (e.g., Landsberg and Tilton, 1983; 82-83). But, it is no more appropriate than those derived from estimates of reserves in the sense that the fixed stock itself is a function of technological development.

18. Proven reserves are defined as remaining conventional resources by producing wells and recoverable with present technology and prices. The estimation was based on the data from World Oil, Vol. 201, No. 3 (August 1985), pp. 31-32.

19. IEA, World Energy Outlook, op. cit., p. 207.

20. The estimation was based on the data from World Oil, ibid., p. 32.

21. IEA, World Energy Outlook, op. cit., pp. 366-367.

22. Dennis Pirages, op. cit., p. 117.

23. The use of coal has been undermined by environmental issues especially in the U.S. The coal issues on the consumption center on air pollution. Coal burning is very dirty relative to oil and natural gas, and technology for control of particulate emissions is very expensive. Sulfur dioxide has proven to be a major problem. In the atmosphere, it combines with water to form sulfuric acid. For example, acid rain in many countries has been a main source for water pollution. see Barry B. Hughes, World Futures (Baltimore and London: The Johns Hopkins University Press, 1985), pp. 110-111.

24. USDA projections as reported in Council on Environmental Quality, The Global 2000 Report to the

President (Washington, D.C.: CEQ, 1981), Vol. 2, pp. 81, 92.

25. The historical background of forecasts of global and regional food production and consumption is well summarized in Hughes' book (1985). The perspective of this book is very useful in understanding world ecological dynamics in the sense that it is fundamentally synthetic and as wide in scope as the future studies it reviews. Barry B. Highes, World Futures, op. cit., pp. 126-130.

26. In 1973-74, only four LDCs were included in the list of importers: Egypt (28%), South Korea (27%), Bangladesh (16%), and Brazil (10%). Barry B. Hughes, World Futures, op. cit., p. 130.

27. U.S. Department of Agriculture, World Agriculture: Outlook and Situation (Washington, D.C.: Government Printing Office, March and September, 1983), and Food and Agricultural Organization, Trade Yearbook (Rome: FAO, 1984).

28. A supply cut has not been found in the relationship between Korea and the United States. But, the case can happen even within a military alliance. An example can be found in the U.S. supply cut of soybean to Japan in the early 1970s. For the strategy of linking food power to political leverage, see Cheryl Christensen, "Food and National Security", in Frank N. Trager, (eds.), Economic Issues and National Security (Lawrence, Kansas: University of Kansas, 1977), pp. 289-318.

29. The South Korean policy toward the Third World is clearly delineated in the June 23, 1973 statement of President Park. It declared, "The Republic of Korea will open its doors to all nations of the world on the basis of the principles of reciprocity and equality" (MCI, 1978; 399). This statement has often been interpreted as the turning point of Korea's deplomacy to end with the previous rigid position which had been affected by the East-West ideological conflict model.

30. Dennis Pirages accurately summarizes the factors in a systematic way. According to his explanation, there are two sets of factors that will determine the success or failure of future cartels composed of exporting countries. " The first set involves all variables mainly from political and economic conditions --- the member of large producers involved, their political and economic perspectives, their share of the total market, the cost of market entry, and so on. The second set of conditions concerns the properties of each commodity, including such variables as relative importance, geographical distribution, possible substitutions, world consumption pattern, ans so forth".

See Dennis Pirages, Global Ecopolitics, op. cit., pp. 149-151.

31. Bruce Russett, "Dimensions of Resource Dependence: Some Elements of Rigor in Concept and Policy Analysis", op. cit., p. 495.; American Metal Market, Metal Statistics (New York: Fairchild Publications, 1984), p. 17.

32. Hans H. Landsberg and John E. Tilton with Ruth B. Haas, "Nonfuel Minerals", op. cit., pp. 86-87.

33. The conditions for copper are at first glance favorable to cartel behavior. Import dependence is increasing, and world copper consumption has risen rapidly. Several political factors also seem conducive to CIPEC success. CIPEC's four original members, Chile, Peru, Zambia, and Zaire, control 55 percent of the non-Communist world's copper exports. Joan Edelman Spero, The Politics of International Economic Relations (New York: St. Martin's Press, 1981), p. 280.

34. The grain companies invest in shipping, grain elevators, communications, and processing plants. They also operate the grain "pipeline" --- all the way from farmer to foreign consumer. Dan Morgan, Merchants of Grain (New York: Penguin, 1980), pp. 319-322.

35. The final judgement is based on the following standard: Where indexes are expressed by percentage; 80-100 (H), 60-79 (M-H), 40-59 (M), 20-39 (L-M), 0-19 (L). For scale indexes; 5 (H), 4 (M-H), 3 (M), 2 (L-M), 1 (L). Exceptional cases are found in the indexes of the item 2 (importance to economy), and the item 5 (likelihood of global scarcity). The judgement for the item 2 is based on the data from Table 5-1 and the contextual analysis of the importance of a commodity to the related industrial sector, such as food, energy, and other export industries. For the judgement of the likelihood of global scarcity, our standard of the judgement depends on the perspectives of a short, medium, and long-term basis.

CHAPTER SIX

KOREA'S PERFORMANCE OF SUPPLY SECURITY

The security position of a nation in foreign resource supplies, as has already been asserted, must be assessed by a careful analysis of not only supply conditions specified by multiple measurements, but also the nation's capability to cope with any supply interruptions. In other words, there can be several policy options that may sharply mitigate what otherwise looks like a situation of high dependence. The purpose of this chapter is to identify some policy options for reducing vulnerability to supply interruptions, and in turn to apply them to Korea's case in the hope of assessing the nation's security position. In doing that, we will concentrate our attention on Korea's energy supply policies.

The selection of energy case is implicitly suggested by its saliency in the criticalness of supply conditions over other fields (e.g., food and non-fuel minerals). Certain characteristics of the energy field arrest our attention to Korea's supply security: 1) the spending for energy imports is higher than its defense expenditures; 2) a complete absence of domestic oil production; 3) the urgent need of substitution for oil; and 4) the importance of oil in its military defense posture. These features further emphasize

the importance of energy supplies for the nation's security.

As for strategies to reduce the vulnerability associated with resource dependence, we already introduced some policy items suggested by Hirschman and Bobrow in Chapter Two. Their main emphasis was to show how a nation could ensure its supply security without depending on military option. It seems realistic to include a possibility of using military force in ensuring a nation's resource supplies at a general level. When the United States faced the two oil crises, the country considered a choice of using military force as a policy alternative.[1] However, this alternative is no longer a concern for Korea, since it is attributed to only major actors with a strong military power. Thus, this study concentrates on some strategies available for the weaker state or any other state that avoids such a military option.

In this case, the items suggested by Hirschman and Bobrow are clearly useful, because they are all non-military options. We have also reviewed other related literatures to see if any other valuable policy items exist.[2] All policy options resulted from this work can be categorized in the following five levels;

1) Stabilizing relationships with major suppliers: An importer is expected to supply its resources from friendly nations to the extent of not interrupting the level of

diversification of suppliers. In addition, an importer needs to develop a strategy not to stand in a weaker position in the relationship with any one supplier. It is suggested that the importance of an importer's share of trade with any one supplier is relatively small in its economy, as compared with its exporter in the same concern. The rationale for this suggestion is that the supplier nation will be in a costlier effect from any supply cut than the importer.

2) Ensuring stockpiles: A well-designed, up-to-date stockpile deserves particular consideration by importers. Release of stockpiled materials can quickly make up for a reduction in imports and provide the breathing space needed to monitor and evaluate the situation before more extensive and usually much more costly long-term measures are adopted. The establishment of stockpiles may be held not only by a government-owned or government-operated program but also by private industries.

3) Developing alternative sources: This policy is to avoid fear of the reduction of the presently dominant resource at the global level. In the case of oil, there is clearly an urgent need among oil dependent countries to develop alternative sources of energy, since oil reserves are in the shortest supply of all natural resources. This includes an expanded use of other energy sources, as well as

the development of new sources of energy.

4) Reducing import dependence: The vulnerability associated with resource imports can also be reduced by increasing supplies from domestic sources and reducing dependence on imports. The measures for improving self-sufficiency involve governmental support for domestic energy industries, economic adjustment to avoid energy intensive structures, resource conservation, and so forth.

5) Securing supply routes: Security conditions of importing nations concerning supply routes vary according to geographic location, types of transport, political outlook, and power position of the nations. It seems clear that securing a nation's supply routes need a comprehensive and flexible posture of its diplomatic relationships with related countries, especially for the weaker nation. It is also suggested that diversification of supply routes is helpful to avoid complete closure of important passageways, and to keep a good relationship with countries which can affect a stable supply of resources.

These five levels of policy options may also be transformed into the criteria for comparative and other analytical studies. In a comparative study, for example, a country which is successful in these policy levels may be more secure than other countries that have less success.

With these five criteria in mind, we will look at Korea's performance with respect to energy supplies.

Relationships with Major Suppliers

Korea imports all of its consumed oil and a significant amount of coal. One way to assess its supply security of energy is to look at the pattern of its relationships with supplier countries. Table 6-1 and 6-2, which indicate Korea's percentage share of oil and coal imports from suppliers, are useful to understand Korea's position in terms of diversification and friendliness of suppliers. They contain all countries which supplied 2 or more percent of Korea's imports in at least one of the years from 1964 through 1984.

Table 6-1 & 6-2

For diversification of suppliers, it was not until the early 1980s that Korea became aware of the importance of diversifying its oil supplies. It is remarkable to see that the first oil shock of 1973 didn't influence Korea toward the concern of diversification, despite its significant dependence on oil in its total energy consumption (55 percent in 1973). The main reason for this is that Korea's

Table 6-1: Korea's Percent Oil Imports from Suppliers

Year	Kuwait	Saudi Arabia	Iran	Neutral Zone	Oman	UAE	Libya	Indo-nesia	Malay-sia	Mexico	Ecua-dor	Arab total
1964	100											100
'65	63.9		36.1									100
'66	59.9		40.1									100
'67	59.6		40.4									100
'68	49.4		50.6									100
'69	43.8	22.4	33.8									100
1970	36.2	31.7	32.2									100
'71	51.5	35.8	12.8									100
'72	50.4	39.8	3.1	6.8								100
'73	18.8	61.3	4.4	15.3								100
'74	16.8	65.4	3.0	14.9								100
'75	45.5	44.0	0.7	8.7								100
'76	39.6	39.8	10.8	8.2								100
'77	32.1	54.0	10.8	0.6								100
'78	30.5	57.6	7.8	2.3								100
'79	32.3	52.3	10.7	0.5				0.6				95.8
1980	27.1	59.6	8.5	3.2				1.8				98.4
'81	21.2	59.7	7.9	1.7		2.9		2.8	1.4		2.5	93.4
'82	12.0	49.6	12.8	0.9		0.3	1.8	8.2	7.3	3.1	4.1	77.4
'83	10.8	30.5	16.3	0.9	9.3	3.7	4.6	4.6	4.9	3.5	4.7	76.1
'84	7.9	17.9	20.0		12.1	6.3	4.9	8.5	7.7	5.9	8.5	69.1

Sources: Economic Planning Board, Korea Statistical Yearbook, Various Issues;
United Nations, Yearbook of International Trade Statistics, Various Issues.

Table 6-2: Korea's Percent Coal Imports from Major Suppliers

Year	U.S.	Canada	Australia	Japan	South Africa	U.K.	China
1973	23.8	16.6	46.2	8.1	5.4		
1979	25.1	16.9	37.0	5.6	11.2	2.3	1.8
1980	22.6	22.7	40.1	6.1	0.4	2.0	5.4
1981	38.5	19.7	32.3	8.8			
1982	25.7	20.7	35.8	6.8			6.5
1983	19.2	24.6	34.7	4.1			6.4

Source: United Nations, Yearbook of International Trade, Various issues.

oil supplies were almost controlled by the major oil companies of the United States. These major companies participated in Korea as a joint venture firm with Korean oil refining industries from 1964. In other words, the two major U.S. oil companies, Caltex and Gulf, supplied their crude oils from three countries (i.e., Kuwait, Iran, and Saudi Arabia). Korean oil industries contracted with these majors to supply its crude oil imports.

The contracts were cancelled, as the U.S. oil companies lost their capacities to supply crude oil from the Middle East as a result of the second oil crisis. The U.S. oil companies unilaterally cut their oil supplies to Korea beginning in 1979. The Majors' share of Korea's's total crude oil imports dropped to 47 percent in 1980, taking only 2 supply sources of Korea's total 8 supply sources. In facing this reduced capacity of the Majors, the Korean government began to secure oil supplies, and to change the structure of Korean oil industries. The main change in the Korean oil industries was a substantial retreat of the government from a direct management of oil industries. The government turned over its property of Korea Oil Corporation (KOCO), the biggest oil refining company in Korea, to one of the private companies. In 1980, Sunkyong Ltd. was selected by the government to take over 50 percent of the equity shares of the KOCO oil refinery, formerly held by Gulf Oil Which withdrew in July 1980 after releasing its 50 percent investment for the oil refinery to the Korea Development

Bank for 93 million U.S. dollars. As a result of this, Korean oil industries were all run by private companies.[3]

Another change occurred in the way crude oil was supplied from exporting countries. Having been alarmed by the revocations of the contracts for supplying crude oils from the Majors, the Korean government tried to obtain new sources of supplies through its own efforts. The governmental officials rushed to the Middle East and other regions to stabilize oil supplies on the G-G base (government vs. government). But, this effort turned out to be ineffective, resulting in only an insignificant accomplishment. For several reasons, exporting countries prefered the D-D base (government of supplier vs. private company of importer) to the G-G base.[4] As a result, the Korean government had to change its policy in such a way as to permit private companies to become involved in importing crude oils.

These changes should not mean that Korea's oil supplies are completely in the hands of private entrepreneurships. Although the government retreated its propertyship from oil refining companies, its intervention remained strong in the control of domestic oil price and sources of crude oil supplies. In other to secure Korea's crude oil supplies, for example, the government has kept the following policies in principle: 1) to permit the oil refining companies to import their crude oil in demands, 2) to permit other private companies to involve in importing crude oil, but

only in the case that they develop new sources of supply, and 3) to permit only one company in one supplier country.[5] As is noted in Table 6-1, since 1981 Korea's crude oil supplies has become diversified, extending to other regions beyond the Middle East, such as Southeast and Latin America. It is also clear that Korea is trying to reduce its dependence on the Middle East oil supplies, even though the share of the region's supplies is still high in 1984 (almost 70 percent).

On the other hand, the nation's coal imports show a relatively well-diversified pattern from the first year. For coal imports, the government closely considered the conditions of all exporting countries before securing its supplies. As seen in Table 6-2, Korea has imported coal from three major countries, Australia, Canada, and the United States, which are all friendly to Korea. Among them, Australia has been a dominant supplier. According to one of the governmental reports, however, Korea will try to reduce the dependence on Australia on the grounds that the latter's coal production is often inconsistent as a result of the frequent strikes. Another reason is that Korea's trade deficit with Australia indicates a need for reducing the imports from the country. Alternatively, the Korean government has planned to increase its imports from the United States and Canada which now have trade deficits with Korea.[6] In addition, it is interesting to note that Korea began to import coal from China which has no formal

relationship with Korea yet.

Table 6-1 and 6-2 also indicate Korea's concern for its pattern relationships with suppliers. For the oil exporters of Arab, Korea was mainly dependent on three countries under the protection of Majors until the second oil crisis; Kuwait, Iran, and Saudi Arabia. The first oil crisis throughout this period gave the highest share of oil to Saudi Arabia, dropping the shares of Kuwait and Iran. This change reflected the ability of the Majors, especially Gulf and Caltex, to supply crude oils to Korea. In other words, the two Majors which were in a joint venture with Korean oil companies, became more dependent on saudi oil. The Saudi share has kept this position even after Korea took over the responsibility from the Majors in the period of the second oil crisis. The reason for Korea's preference of Saudi oil can be explained by the fact that Saudi Arabia is the most stable supplier in the Arab region. In more specific terms, its moderate position in OPEC and North-South issue, and its strong ties with Korea in terms of economic context, are clear factors for supporting the Korea's concern of oil supplies.

It is interesting to see what Korea is trying to keep in its pattern with suppliers on the basis of the latest figures. The shares with the two major suppliers, Kuwait and Saudi Arabia, have reduced significantly, while the shares with other suppliers have been gaining more. Although the share of the Arab region in Korea's total oil

import is still high, it is distributed farily among many countries. No dominant position is seen in the 1984 figure. Another remarkable point is that Korea has kept a close relationship with Iran and Libya which are hostile to the Western countries. The shares of the two countries are not insignificant, since they are almost 30 percent in the 1984 figure. This feature raises a question about the susceptibility of the current suppliers to supply cuts chiefly stimulated by political reasons. This possibility directs us to examine the diplomatic relationships between Korea and other related regions or countries. For oil supplies, it is essential to examine Korea's diplomatic posture toward the Third World in a broad context, and the Arab region and countries in a specific basis.

Until the year of the first oil crisis, Korea's diplomatic posture had long been characterized by its strict adherence to anti-Communism. The application of this principle to foreign policy brought about an extremely passive stance against Communist countries and many developing countries.[7] This policy, in effect, amounted to the rupturing of diplomatic relations with nations establishing formal diplomatic ties with its enemy, North Korea. Thus, although Korea tried to penetrate the Third World regions, no remarkable achievements were attained for this period.

This strict stance to the ideological polarization was released in 1973, when the President Park declared a

realistic approach in the nation's diplomatic posture. It was proclaimed in the new approach that Korea would be ready to establish its diplomatic relationship with any other country, regardless of ideological difference. The pressure for this change was mainly from the emergence of the Third World as an international power bloc in terms of political, economic, and ecological importance. No pressure from military security dimension was seen, because the conflict between North and South Korea has not presently been reduced. For any reason, this change was timely when considering Korea's increasing demands for vital resources from the Third World.

Once the Korean government set up its readiness to take a more realistic posture in diplomacy toward the Third Word countries, the operational objective has been how to penetrate the region under the circumstances of North Korea's dominance and the emergence of North-South conflict as a global issue. Until recently, the image of South Korea in the Third World was generally overshadowed by a complete client of the United States because of its dependence on the U.S. troops for its military defense, and North Korea's diplomatic propaganda to criticize South Korea as a colony. This image was well expressed in the votings on Korean issue at U.N. General Assembly. As seen in Table 6-3, South Korea's attempt to participate in U.N. as a regular member had been rejected with an increasing number of "against" votes. This was due to South Korea's image as a client

state among especially newly independent countries in the Third World.

Table 6-3

Another serious obstacle for South Korea was its recessive position in the Non-Aligned Movement as compared with North Korea's status. While North Korea was accepted as a regular member from the organization in 1975, South Korea's offer was successively turned down. The main factor for the South Korea's disappointment was the presence of U.S. troops in South Korea. The organization adopted recommendations which are designed to withdraw the U.S. troops from South Korea as its agreed opinion.

South Korea's basic strategy to enhance its inferior status in the Third World has been to penetrate the region on the basis of bilateral negotiation. The government found it meaningless and ineffective to raise the Korean issue in the international organizations. The policy objective has been focused on the persuasions of the Third World countries to turn down any agenda raised by North Korea. Thus, whenever the formal meetings from the organizations (U.N. and the Non-Aligned Movement) were scheduled to open, Korea has dispatched special government emissaries to the Third World countries. On the other hand, Korea has so eagerly

Table 6-3: Votings on Korean Question at UN General Assembly

Session	Member	(For)	(Against)	(Abstention)	(Absent)
18th(1963)	111	64	11	22	14
20th(1965)	117	62	12	29	14
21st(1966)	122	66	19	24	13
22nd(1967)	122	67	23	23	9
23rd(1968)	126	72	23	26	5
24th(1969)	126	72	26	21	7
25th(1970)	127	67	28	22	10
29th(1974)	138	61	43	31	3
30th(1975)	143	59	51	29	4

Source: Yonhap News Agency, Korea Annual, 1985, p. 59.

penetrated the region bilaterally that its diplomatic map in the region has increasingly been extended in its favor. In terms of diplomatic race, South Korea has recently dominated North Korea in the Third World area with the exception of Africa. In particular, Korea's blatant effort has been made in the Middle East where North Korea had been dominant for a long time.

Table 6-4

The dramatic upset in the Middle East was provided by South Korea's de facto abstention of the diplomatic relationship with Israel. Largely uninvolved in the region, South Korea had formally recognized Israel in 1962, and permitted the Israeli government to establish a full embassy in Seoul in 1969. While the decision gave South Korea a valuable support for its military security, it came at the cost of economic security. It also gave North Korea a very clear-cut diplomatic superiority in the Middle East. The major event that led to a fundamental change in Korean-Middle East relations was undoubtedly the oil crisis of 1973-74. South Korea found from its economic and social structure that a severe dependence on oil becomes a critical component of national security. The first response from Seoul was to set forth a policy line overtly sympathetic to

Table 6-4: North and South Korea: The Diplomatic Race in the Third World (the number of countries in diplomatic relation)

Region	1975		1984	
	South	North	South	North
Middle East	7	11	13	3
Asia	21	21	24	20
Africa	28	37	33	44
America	26	6	29	10

Sources: Ministry of Foreign Affairs, Korean Diplomacy 30 Years: 1948-1978, 1979; Yonhap News Agency, Korea Annual , 1985.

the Arab position. This somewhat timid response was later replaced by a clearer change in 1977 when the Israeli embassy was removed from Seoul to Tokyo. Since then, Israel has had neither an embassy, a consulate, nor a trade mission resident in South Korea. This was clearly an initiative designed to reduce the political costs Korea had discovered it was incurring as a direct result of its relationship with Israel.[8]

Despite this significant achievement in diplomatic war with North Korea, however, it will be fairer to say that Korea's dependence on the Third World countries for resource supplies is not as secure as its dependence on the U.S. alliances. The reason for this point is clear: the U.S. alliances have not confirmed North Korea's status yet, and therefore, no threat from North Korea exists on this dependence. In this sense, Korea's dependence on the U.S. alliances for its coal imports is fairly secure. By contrast, its dependence on the Third World countries for its oil imports is in many ways shaky, despite its consistent efforts to strengthen its diplomatic ties with them. This instability might be occurring because the diplomatic war between North and South Korea is still going on in many countries of the Third World.

One way of examining the reliability of the current oil suppliers is to look at the diplomatic race between South and North Korea in related countries. As Figure 6-1 shows, the most friendly suppliers are Saudi Arabia, Oman, UAE, and

Ecuador, on the grounds that those suppliers do not have a formal relationship with North Korea. Iran and Libya are the most unreliable for South Korea, since they maintain an associative posture toward North Korea and they are hostile to Korea's major security ally, the United States. Thus, it is recommended that Korea's increasing dependence on the two countries should be reconsidered from the point of supply security.

Figure 6-1

Despite their association with North Korea, the other three countries, Indonesia, Mexico, and Malaysia, are released from this concern, because of Korea's sustainable shares with them and their closer relationship with the United States. As for coal suppliers, one point is remarkable from Table 6-2. Korea's coal imports from China began as a result of the normalization between the U.S. and China. Korea has a clear advantage in importing China's coal because of its geographical proximity and cheap price. It is also recommended that the country should not go beyond the levels of the three major suppliers, the U.S., Canada, and Australia. Although China has shown a positive posture to other Western countries in economic interactions, it has still firmly maintained political support to North Korea in

Figure 6-1: Diplomatic Race in the South Korea's Oil Suppliers (As of 1984)

	South Korea	North Korea
Kuwait	E: 6/11/1978	T-1: 3/1/1968
Saudi Arabia	E: 10/16/1962	-----
Iran	E: 10/23/1962	E: 4/19/1973
Oman	E: 3/28/1974	-----
UAE	E: 6/18/1980	-----
Libya	E: 12/29/1980	E: 1/30/1974
Indonesia	E: 9/17/1973	E: 4/16/1964
Malaysia	E: 2/24/1960	E: 6/30/1973
Mexico	E: 1/26/1962	E: 9/9/1980
Ecuador	E: 10/5/1962	-----

Notes: E: Embassy T: Trade Mission

Sources: Ministry of Foreign Affairs, Korean Diplomacy 30 Years 1948-1978, 1979; Yonhap News Agency, Korea Annual, 1985.

terms of Korean issues.

It is obvious that even the most careful selection of suppliers based on diversification of suppliers and seeking friendly suppliers is not sufficient to remove vulnerabilities. The relationships involved are more complex and need to be further examined with other concerns. The final analysis deals with relations between Korea and its major energy suppliers in terms of the importance to each party of the energy trade. Four indices are calculated from appropriate data, and they are reported for individual supplier countries in Table 6-6. The formula of calculation is added in Table 6-5.[9]

The first two indices reflect trade concentration for the particular energy commodity. The first index shows the extent to which the energy exporter disproportionately concentrates its energy exports on the Korean market. The index is comprised with the exporters' total exports of the commodity and world imports of the commodity. The second index shows the extent to which Korea disproportionately concentrates its energy imports on a given supplier. Korea's total imports of the commodity and the supplier's total exports of the commodity in world export market will be comparatively examined. In both cases, the scores can be interpreted absolutely and relative to each other; the larger the score the higher the concentration. In other words, a higher number on the first index (A) means supplier's reliance on the Korean market. A higher number

on the second index (B) means Korea's reliance on that supplier.

The third (C) and fourth (D) indices show the importance of energy trade with Korea from the perspective of the supplier's total exports, and that of Korea's energy imports from a particular supplier to Korea's total imports. Implicit in these indices is that the higher the number, the greater the dependence. Korea has a relatively stable position in the relationship with each supplier in the following situations: 1) its imports of the energy commodity are not disproportionately concentrated on a given supplier while the supplier's exports are highly concentrated on Korea; and 2) Korea's imports of the commodity are modest in its total imports while playing a large role in the supplier's total exports. When these two conditions are met, Korea is safer than the supplier in avoiding disruption of the energy trade relationships.

Table 6-5 and 6-6

In Table 6-6(A) Korea's positions in its relationships with major oil suppliers in terms of concentration are generally better than those of all suppliers reported in the table. In other words, index B as compared with index A in each country is relatively smaller. In addition, Kuwait,

Table 6-5: Formula of Energy Trade Concentration and Importance

1. Index A: Concentration of exports by exporter for the particular commodity on Korea

$$= \frac{X^c_{ji} / X^c_j}{M^c_k / (M^c_w - M^c_k)}$$

X^c_{ji} = country j's exports of C to Korea

X^c_j = country j's total exports of C

M^c_k = Korea's total imports of C

M^c_w = World Imports of C

2. Index B: Concentration of Korea's imports of the particular commodity on the specified supplying country

$$= \frac{M^c_{ki} / M^c_k}{X^c_i / (X^c_w - X^c_i)}$$

M^c_{ki} = Korea's imports of C from country i

M^c_k = Korea's total imports of C

X^c_i = Total exports of C by country i

X^c_w = World exports of C

3. Index C: Importance of Korea's imports of a particular energy commodity to the total export of performance of the supplier

$$= \left(X^c_{ji} / X^c_j \right) \cdot \left(X^c_j / X_j \right)$$

X^c_{ji} = country j's exports of C to Korea

X^c_j = country j's total exports of C

X_j = country j's total exports

Table 6-5 (Cont'd)

4. Index D: Importance of Korea's imports of a particular energy commodity from a particular supplier to Korea's total import activity

$$= (M^c_{ki} / M^c_k) \cdot (M^c_k / M_k)$$

M^c_{ki} = Korea's imports of C from country i

M^c_k = Korea's total imports of C

M_k = Korea's total imports

Table 6.6(A): Korea's Relationships with Major Oil Suppliers

	Saudi Arabia			
	A	B	C	D
1970	2.76	2.02	0.02	0.02
'75	1.86	1.21	0.02	0.07
'80	1.71	1.02	0.03	0.15
'82	1.72	1.01	0.04	0.12
'83	1.37	0.57	0.03	0.03

	Kuwait			
	A	B	C	D
	4.03	2.77	0.03	0.02
	7.79	6.49	0.07	0.08
	5.69	5.11	0.08	0.07
	8.44	7.65	0.07	0.03
	5.73	3.95	0.05	0.01

	Iran			
	A	B	C	D
	2.95	2.32	0.02	0.02
	0.05	0.03	0.001	0.001
	2.24	2.02	0.03	0.02
	2.36	3.46	0.04	0.03
	2.33	2.20	0.04	0.03

	Indonesia			
	A	B	C	D
1980	0.45	0.29	0.03	0.002
'81	0.67	0.61	0.006	0.006
'82	1.40	1.20	0.02	0.02
'83	0.77	0.68	0.01	0.008

	UAE			
	A	B	C	D
'81	0.51	0.45	0.008	0.007
'82	0.05	0.04	0.001	0.001
'83	0.61	0.53	0.008	0.007

	Oman			
	A	B	C	D
'83	5.63	5.29	0.12	0.02

	Malaysia			
	A	B	C	D
'81	1.48	1.40	0.007	0.003
'82	5.63	5.21	0.03	0.02
'83	3.43	3.26	0.02	0.01

	Mexico			
	A	B	C	D
'82	0.50	0.43	0.007	0.007
'83	0.50	0.44	0.006	0.007

	Ecuador			
	A	B	C	D
'81	6.77	6.41	0.06	0.006
'82	7.08	6.40	0.1	0.01
'83	5.92	5.53	0.1	0.01

	Libya			
	A	B	C	D
'82	0.36	0.32	0.007	0.004
'83	0.91	0.81	0.02	0.01

Sources: IMF, Direction of Trade Statistics; UN, International Trade Statistics Yearbook; UN, Commodity Trade Statistics.

Table 6-6(B) Korea's Relationships with Major Coal Suppliers

	U.S.				Canada			
	A	B	C	D	A	B	C	D
'79	0.80	0.42	0.001	0.004	3.72	2.96	0.001	0.003
'80	0.73	0.38	0.001	0.004	4.61	3.49	0.001	0.004
'81	2.09	0.57	0.001	0.01	6.86	2.94	0.002	0.006
'82	0.75	0.33	0.001	0.008	3.62	2.62	0.001	0.006
'83	0.63	0.34	0.001	0.003	3.14	2.51	0.001	0.003

	Australia				China			
	A	B	C	D	A	B	C	D
'79	2.81	2.00	0.001	0.006	1.118	1.06	0.001	0.001
'80	3.24	2.20	0.001	0.008	3.35	2.70	0.001	0.001
'81	3.97	1.48	0.01	0.01	---	---	---	---
'82	2.48	1.58	0.01	0.01	3.27	2.60	0.002	0.002
'83	1.57	1.02	0.01	0.006	2.53	2.20	0.001	0.001

Sources: IMF, Direction of Trade Statistics; UN, International Trade Statistics Yearbook.

Iran, Oman, Malaysia, and Ecuador are cases where both parties (Korea and any one of the countries) are disproportionately concentrated on each other. This means that both would find themselves difficult in avoiding disruption of the trade relationships.

As for the importance of a trade relationship, it appears that for Ecuador and Oman, their oil exports to Korea are far more important to their total exports than to Korea's total imports. Other suppliers share almost the same degree with Korea. It is remarkable to see that all suppliers do not maintain a better position in this regard on the basis of the latest figure (the year of 1983), with the exception of Mexico holding a slight advantage. Overall, Korea stands in better position with Kuwait, Oman, Malaysia, and Ecuador, in the sense that the suppliers' exports are disproportionately concentrated on Korea and their export earnings from Korea are more important than their exports are in Korea's total imports. Thus, any supply cut from these suppliers would result in a costly effect to the suppliers more than Korea.

There may be a liability of supply cuts from such suppliers as Indonesia, UAE, Mexico, and Libya. These countries are characterized as a low dependence on Korea for their oil exports. Even in that case, however, Korea can easily switch to other suppliers, since Korea's dependence on them is also minimal. An ideal situation in which a supplier has leverage over Korea is exemplified by the case

of Saudi oil during 1980-82. Both parties' level of disproportionate concentration was relatively high. Saudi Arabia had asymmetrical leverage over Korea in terms of the importance of the trade to each economy. But, the 1983 figure shows Korea's remarkable effort to mitigate its weakness by reducing its imports from Saudi Arabia.

On the other hand, the table for coal supplies shows that the three suppliers, Canada, Australia, and China, with the exception of the United States, are disproportionately concentrated on the Korean market. Korea's concentration on these suppliers is also high, but it is more favorable than those of the suppliers. Recently, Australia's coal has been reduced in its importance in Korea's economy, while Canada's coal is still important to Korea. As far as asymmetrical leverage is concerned, the United States has an advantage over Korea, because of its low level of concentration and relative safety from trade disruption. But, Korea's concentration on the U.S. coal is better than that of the United States. From Korea's standpoint, a possibility of the U.S. clear-cut leverage can be mitigated by this concern from Korea's standpoint. Thus, it is safe to say that there is no clear pattern in which any party has asymmetrical leverage in the coal trade.

In summary, Korea has pursued its relationships with major suppliers in terms of supply security especially since the late 1970s. Although the analysis of Korea's

performance on the basis of diversification and friendliness of suppliers, and the relative advantage in bilateral trade, doesn't sufficiently indicate Korea's secure position in an ideal basis, it is fair to say at least from its recent performance that Korea is ready to take on such requirements in managing its relationships with major suppliers. It is no doubt that this flexible position resulted from Korea's blatant trade-off; an emphasis of ideological preoccupation with a loose but more comprehensive understanding of national interests in the course of its diplomatic activities.

Stockpiling

The purpose of stockpiling is to provide protection against possible disruptions of supply. Although it is far from the fundamental solution of a country's supply problems, stockpiles become a very useful policy instrument to deter cartel attempts or to moderate the impacts of cartel once they have been formed. Stockpiling can be effective to absorb the impacts of a sudden cutback from a particular supplier. In addition to the pure economic purposes, stockpiling has also been emphasized in the countries that are in danger of military threat to their survival. In such cases, stockpiling becomes an essential component to a nation's defense readiness for its strategic purposes.

The concern of stockpiling has appeared overwhelmingly in the strategic thinkings of especially Western countries which are increasingly deficient in natural resources. In these countries, the term "strategic materials" or "strategic resources" is often used to trigger the national concern on the need to stockpile some items in short supply. The United States is a typical country that is so ambitious in this concern and real practice. The goals and items for stockpiling in the United States have changed over time. The country has long operated this effort under the authority of the Strategic and Critical Materials Stock Piling Act. The act began in 1939 to establish a three-year conventional war as the basis for setting stockpile goals. According to 1980 figures, the U.S. goals for stockpiling involve 60 commodities, assuming that each has a duration period of one year.[10] The similar process is also underway in other Western countries, but with a little difference in their ways and practices.

It should be remembered, however, that the advantages of stockpiling are not always accepted by all. Stockpiling also involves some economic disadvantages. In other words, governments may make acquisitions and releases for reasons other than emergencies. For example, as part of its battle against inflation, the Johnson administration released or threatened to release stockpiled materials to discourage domestic producers from raising their prices. In this case, industrial producers can be expected to oppose such

operations as undesirable government interference.[11] Weighing both the advantages and disadvantages of stockpiling, it is difficult to escape the conclusion that it is a relatively inexpensive, expeditious way of reducing the vulnerability associated with import dependence. Moreover, some of the cited drawbacks can partly be amenable to correction; they can be minimized by carefully timed and reduced operation but not eliminated. The necessity for stockpiling is undoubtedly accepted in the countries that have a clear-cut military enemy. Our concern on supply security is clearly on the side of advantages of stockpiling at the risk of its disadvantages. Thus, the level of a country's stockpiling is an important factor in measuring its supply security.

Korea has not had such a comprehensive plan for stockpiling as is seen in Western developed countries. In the energy field, however, Korea began to develop a systematic plan for stockpiling oil by establishing Ministry of Energy and Resources on January 1, 1978. The new ministry took over administrative functions related to resources and energy from Ministry of Commerce and Industry. The purpose was to effectively develop major resources and energy sources at home and abroad and to control resources and consumption. Before the establishment of this ministry, there was no observable effort to stockpile oil. The task was in the hands of oil companies under the auspices of the government. It is estimated that Korea's oil stockpiles

remained at approximately 20 days' consumption in 1977.

Ministry of Energy and Resources began to embark an ambitious plan for oil stockpiling from 1978. First, it imposed a tax on imported crude oil of 3 percent to prepare for the financial basis for building stockpiling facilities. Second, the ministry enforced oil companies to stockpile up to 60 days' consumption until 1983 under the support of governmental subsidy. Third, the ministry also planned to start the construction of two stockpiling facilities from 1979 in an effort to maintain the governmental stockpiles at 60 days' consumption until 1986.[12] Although the initial objective has not been attained as planned, Korea's stockpiles reached 70 days' consumption as of 1984, of which the governmental stockpiles are estimated as approximately 20 days' consumption.[13]

This level is still behind that of Western developed countries which are estimated as having up to ninety days' consumption as of 1984. This level was recommended by the International Energy Agency (IEA) that is an international organization confined basically to industrialized non-communist states.[14] The NICs, especially oil importing countries such as Taiwan, Singapore, and South Korea, couldn't participate in the IEA. Thus, these countries had to maintain stockpiling in their own policy efforts. Taiwan, for example, already attained 63 days' consumption in oil stockpiling in 1979. Korea, although it started late in oil stockpiling, is now projected to attain a level of

110 days' consumption (government 60 + private 50) until the end of 1988.

As in the case of oil, the Korean government also stockpiles coal in preparation for emergency. The government-led stockpiles have increased from the level of 7 days' consumption in 1979 to the level of 25 days' in 1984.[15] The coal holdings of private companies have increased from a level of 77 days' consumption in 1979 to more than a level of 5 months in 1984. Thus, Korea's coal supply is much safer than oil supply in the sense that it can endure a longer period of time during a supply threat. In short, the Korean government has shown its concern for stockpiling of energy resources since the Ministry of Energy and Resources made its commitment in 1978. Although the present level of stockpiles in oil does not reach the level of Western developed countries, the government's long term goals are based on the attainment of a higher level, not only to catch up with developed countries, but to fundamentally secure its energy supplies.

Developing Alternative Sources

As an energy-deficient country, Korea is expected to work at diversifying its energy resources. Implicit in this expectation is that a country's reliance on one form of energy resource would be worse than relying on many forms. This concern is of course limited in its applicability; not

all energy importing countries are expected to reflect this concern in their energy policies. In fact, the applicability of this concern is a function of many factors such as the level of resource dependence, the structure of domestic energy resources, the accessibility of global resources, and so forth. However, certain countries like Japan and Korea that have no sufficient supply in any energy resource are clearly expected to be active to this concern, simply because of their high dependence on foreign energy supplies. The effort to diversify energy sources includes mainly two policies: the diversification of energy supply sources to the extent that the present technology can permit their consumptions on the basis of safety and economic efficiency; and the technological development to introduce new sources of energy into usable forms.

1) Diversification of Energy Resources

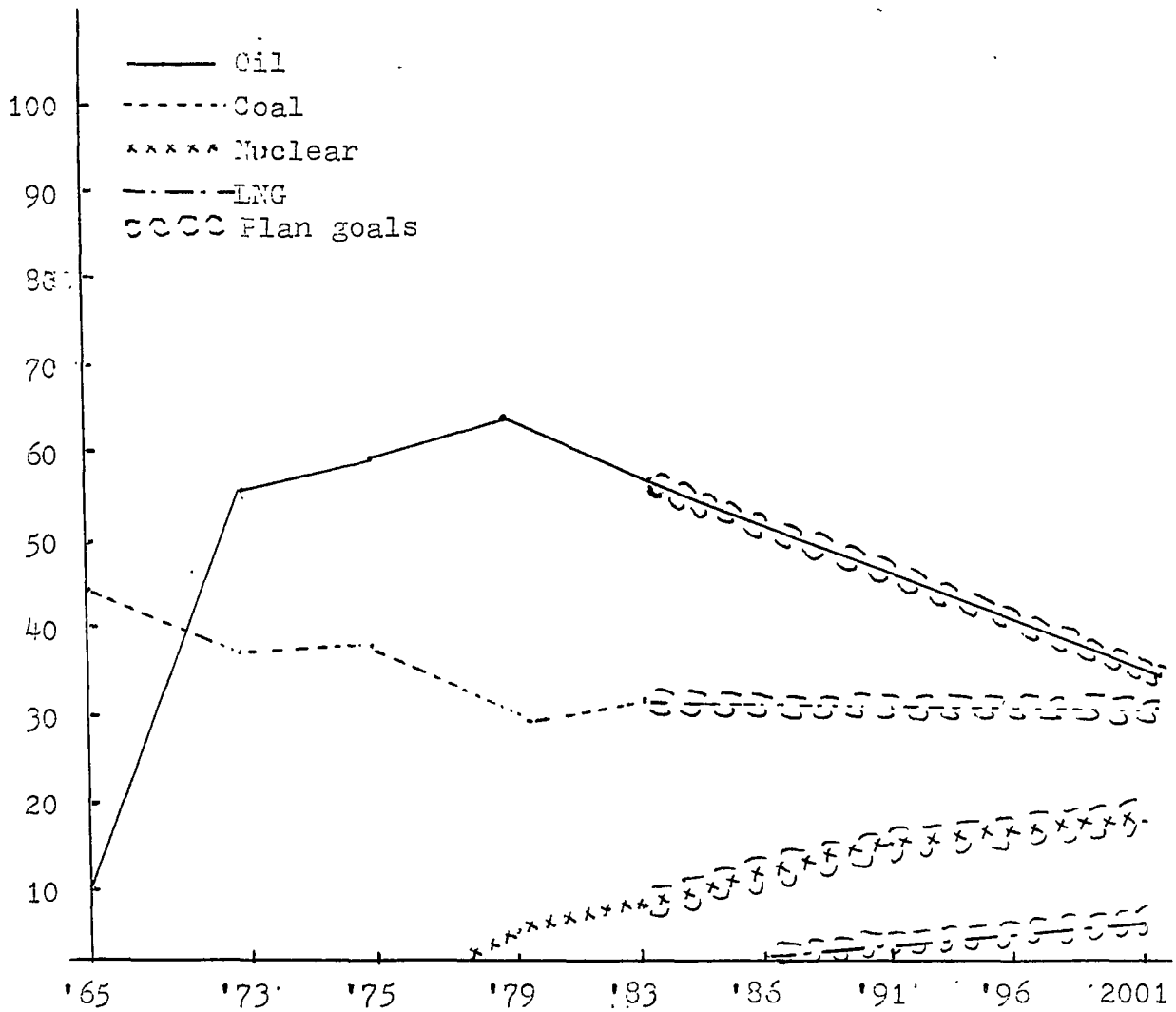
Korea's reliance on one form of energy resource, oil, has clearly been reduced and is projected to decline further. The paths for oil, coal, and nuclear energy relative to total energy requirements appear in Figure 5-2. It shows that the pattern of Korea's energy consumption has moved to a reliance on multiple dimensions of energy resources since the late 1970s. This pattern will keep its saliency in the future by the governmental effort which is projected to introduce alternative resources while reducing

the presently dominant type's share (oil). Korea's energy supply target has been set in the form of a long-term supply and demand outlook. This is more than a mere forecast. It plays an important role in setting specific targets for Korea's energy policy, and also forms the basis upon which various economic and industrial policies are formulated. The current outlook in the title of "The long-term Strategy of Energy Supply Toward the Years 2000" was released in 1985, with projections for various energy sources. According to this report, Korea's dependence on oil as a primary source of energy is expected to drop to 47.4 % by 1991 and 39 % by 2001, compared with 63 % in 1979. The projection also placed a heavy emphasis on the use of coal, nuclear energy, natural gas, and other possible resources.

Figure 6-2

Oil: Korea's consumption of oil had shown a rapid increase (annual average rate of 30 percent) until the second oil crisis, although it showed a brief stagnancy during the first oil crisis. Thus, oil has been a dominant type of resource since the late 1960s, and its highest share of total energy requirements was 63.5 % in 1978. To curb this increasing consumption of oil, since 1979 the government has pursued energy conservation, substituting

Figure 6-2: Energy Type Diversification (% share of total energy consumption)



Source: Ministry of Energy and Resources, The Long-term Strategy for Energy Supply toward the Years 2000, 1985, p. 36, 46.

coal for oil in electric power and cement industries. As a result, Korea's consumption of oil has steadily reduced, not only in its share of total energy requirements, but also in its annual rate of demands. Nevertheless, oil will remain dominant in Korea's energy consumption at least until the year 2001. The long-term prospect predicts that the requirement of oil will increase from the present level of 520,000 Bb/a day to 990,000 Bb/a day in 2001. Thus, the supply of oil will continue a main issue for Korea's energy security.

Coal: As no liquid energy resources have been discovered so far, and hydraulic energy resources are poor, anthracite coal has been the nation's major energy resource. During the First Five-Year Economic Development period (1962-1966), coal took a dominant position in the composition of the nation's total energy consumption. This pattern began to change after the latter half of the 1960s. The government adopted a new energy policy calling for the substitution of oil for anthracite coal as fuel. Thus, the production of anthracite coal had greatly decreased by 1970 from the peak of 12,436 thousand tons in 1967.

After the first oil crisis in 1973, the government was forced to reconsider the coal industry, and offered subsidies and tax exemptions to spur coal production. Output of coal then increased by 10 percent per year from 1973 to 1975. The 1975 production of 17.6 million tons was

greater than demand, and nearly 80 mines went bankrupt in 1976. From 1977, however, demand for coal increased each year and the domestic production of approximately 18 million tons was insufficient to meet demand. The government thus began to import coal beginning in the latter part of the 1970s. The government has encouraged coal industries to vigorously increase their productions as a way of reducing its dependence upon imported energy sources. Government loan funds have been available through the Korea Mining Promotion Corporation, and financing has been made for coal stockpiling during the off-season to avoid price fluctuations. Other assistance to the industry included freight rebates for rail transport, preferential treatment in transmission and distribution facilities, and special support related to mine exploration activities.[16]

Although the government has been making great efforts to maximize the output of domestic energy resources, it is expected that Korea cannot but depend on foreign countries to meet the increasing demands. In the 1983 figure, coal was second priority in the composition of the nation's energy requirements. Sharing almost 35 percent, this position is projected to keep constant until the year 2001. But, it should be noted that the possibility for further increase of domestic coal supply is in doubt, as the governmental report predicts.[17] The prediction is mainly based on the evaluation of Korea's shortcomings in mining conditions. Thus, the government tries to substitute

Table 6-7: The Supply Prospects of Energy Resources

Resource Type	Unit	1983	1986	1991	1996	2001	Average Annual Increase Rate (%)		
							'70s	'80s	'90s
Oil	1000Bbl	191,294	223,430	267,117	305,342	359,559	9.9	3.9	3.0
Anthracite Coal	1000M/T	21,670	23,279	21,324	19.832	18,667	6.3	0	-1.3
Bituminous Coal	1000M/T	9,633	14,462	20,885	34,935	51,075	63.0	10.9	9.4
LNG	1000M/T	---	403	2,000	5,000	5,000	---	---	9.6
Hydraulic	GWH	2,723	3,001	4,060	4,236	5,075	7.5	4.1	2.3
Nuclear	GWH	8,965	21,698	47,335	58,701	82,559	---	32.2	5.7
Others	1000TOE	2,378	2,171	2,201	2,803	3,934	-4.9	-1.2	6.0
Total	1000TOE	49,700	59,654	79,099	99,889	124,155	8.2	5.6	4.6

Source: Ministry of Energy and Resources, The Long-term Strategy of Energy Supply toward the Years 2000, 1985, p. 48.

demands of anthracite coal by introducing LNG for consumption, as we can see in Table 6-7.

While anthracite coal has been a main resource type for household consumption, bituminous coal has been used for industrial energy especially since the government projected a reduction of oil consumption. In other words, the consumption of bituminous coal plays an important role in curbing the increase of oil consumption. Since Korea has none of this type of coal in its resource base, the change from oil to coal is simply an introduction of another type of resource dependence. But, it is clear that the changed concern for supply security means more than a change in resource dependence; the dependence of coal is much safer than that of oil in general.

Nuclear power: Nuclear energy takes third position in Korea's total energy consumption, with its share being 4.5 percent in 1984. The government is trying to increase this share to 16.6 percent by the year 2001. Nuclear energy is mainly used as a source of electric power generation. The energy resources used for power generation in Korea until recently comprised petroleum, anthracite coal, and hydroelectric power. Of these resources, petroleum, the supply being dependent on imports, took a leading part in energy resources. Among energy sources for power plants, the ratio of petroleum increased dramatically from 14.9 percent in 1965 to 94.6 percent in 1974.

The government, however, began to replace petroleum as an energy source, and promoted the installation of nuclear power plants as the main way to convert. With the completion of the first nuclear power plant, Korea became dependent on nuclear energy for electric power generation from 1978.[18] Two more plants have been completed since 1978 and as of 1984 three nuclear plants were operational. By this effort, Korea's dependence on petroleum in electric power generation dropped to 69.2 percent, while its dependence on nuclear power increased to 18.2 percent. The government projects continuation of this effort maintaining an objective of almost 50 percent until the year 1991. To this end, the government is now building six more nuclear plants.

Natural gas: The last type of energy resource in Korea's future energy supply is natural gas. The global consumption of natural gas has increased since 1950s, as a world natural gas market developed through the use of tankers. Natural gas may be an alternative to petroleum, but it does not offer a ready solution to depletion problems. Although natural gas has a longer reserve supply than petroleum (58 years as compared with 34 years of petroleum), it is still considered a short supply energy resource. The distribution of its production is even more risky for Korea to depend on natural gas as a way of reducing oil dependence, since almost 70 percent of its world production is concentrated on

such areas as the Middle East and the Communist world. The stable suppliers for Korea are limited to some Asian or Latin American countries which have only 10 percent of world production.[19]

Another important problem associated with the consumption of natural gas lies in the fact that the resource needs a sophisticated level of technology in its treatments. The possibility of explosion at sea or in port exists, since the resource can be transported in a highly volatile process.[20] For this reason, the consumption of natural gas is concentrated in such highly developed countries as the United States, Western European countries, Japan, and the Soviet Union. On the other hand, the consumption of natural gas brings some remarkable advantages: its wide adaptability in household, electric power generation, and industrial usage, and no side effects on environment.

Table 6-8

The Korean government has considered importing natural gas as a strategy for diversifying the sources of energy supply since the early 1980s. As a preparatory stage, the government is now constructing all facilities, and has searched for supplier countries. The government already

Table 6-8: The Prospect of Natural Gas Supply (1000 Tons)

	1987	1989	1991	1996	2001
Demand	1,641	2,000	2,000	5,000	5,000
Household	100	283	506	1,424	2,157
Industry	14	78	129	266	409
Electric Power	1,527	1,639	1,365	3,310	2,434
Supply	1,641	2,000	2,000	5,000	5,000

Source: Ministry of Energy and Resources, ibid., p.142.

selected Indonesia as a supplier for natural gas in 1983, and contracted with the country to import 2,000,000 tons of LNG annually from 1987 to 2006. In addition, the government is examining such countries as Malaysia, Qatar, and Canada as a future supplier. According to the long-term prospect provided by the Ministry of Energy and Resources, Korea's consumption of natural gas will begin in 1987, and its share of Korea's total energy requirements will increase from 3.3 percent in 1991 to 5.2 percent in 2001.[21]

2) Technological advancement for developing new sources of energy

Korea's case shows an effort to diversify its sources of energy resources. It is also clear from this case that the nation's energy consumption will heavily depend on fossil fuels, such as petroleum, coal, and natural gas until at least the year 2001 when the long-term prospect ends. Korea is not self-sufficient in these resources. It is doubtful that a long-term supply of these resources will be available. These considerations lead to an examination of the nation's capabilities to substitute fossil fuels for other new sources of energy.

It was not until the late 1970s that Korea started a comprehensive effort to develop new sources of energy. Even before this period, many studies were proceeded by academic communities and research centers led by private industrial

companies. With the creation of the Ministry of Energy and Resources in 1978, however, the scattered efforts became concentrated under the guidelines of governmental plans and strategies. The governmental involvement in this field has brought intense motivations to the development of this effort. First, it is now under way to create a research organization which involves academic, business, and governmental personnel. The government is going to control this organization in such a way as to advance technological skills for the practical use of new energy sources. This organization is divided by three departments --- natural energy, fossil fuels, and new sources of energy --- as characterized by alternative sources of energy. Second, the government is projecting the encouragement of the consumption of new sources of energy. After 1986, this plan will be widely applied toward the goal of sharing 3 percent of total energy consumption in 2001. To this end, the government is ready to help the use of new energy sources by providing various advantages such as subsidies and tax exemptions.

New sources of energy besides fossil fuels may be categorized in three groups; the sun, thermonuclear fission and fusion, and gravity. Among others, solar energy may be the most promising resource in the sense that it does not depend on finite and nonrenewable energy resources. Solar energy is being used increasingly to heat houses. Fusion of hydrogen atoms will offer a longer-term solution to the

energy crisis along with the presently used nuclear energy. Finally, gravitational sources of energy, such as the tides and winds, are also promising possibilities. The extent of success that these resources can substitute for the current usages of finite fossil fuels will be determined by the degree of technological advancement. The following resources are now under examination for future energy alternatives in Korea.

Solar energy: Developed countries such as the United States, France, and Japan have developed solar energy as a source of household and electric power generation. By contrast, the current level of Korea's technological advancement has remained at one level; to heat house-buildings. As of 1983, Korea had a total of 2410 house facilities which use solar energy for heating. The government projects the use of solar energy in generating electric power from 1986. The government has already provided facilities in 531 places. Some private industrial companies related to the production of electronic commodities are now considering wide use of solar energy for electric power generation beginning in 1988.

Wind energy: Wind can be a source for generating electric power. The United States is now developing technological systems to use wind energy in the Colorado area. The country already succeeded in making small

generators holding 1, 8, 40 KW in 1977, and is now developing bigger size of MW class. Japan also established a wind-power plant to generate 100 KW in 1980 and is now testing its practicability. Korea selected Cheju island as a sample area for developing wind-power energy in 1981. The Ministry of Science and Technology built a facility for 10 KW class as a test case in 1980. The current project that includes government and private industries in a joint with the MAN company of Germany is testing a wind-power plant of the 14 KW class for its practicability.[22] The government projects to supply this system in such a underdeveloped areas as small islands. But, the importance of this energy source is negligible in the country's total energy requirements, as we can see in Table 6-9.

Table 6-9

Small hydraulic-power: Electricity can be generated by using a small water power source. This technology has widely been applied in China that now has 88,000 power plants. Japan and France also have some power plants to supply electric power. The Korean government has reviewed possible areas for this type of system, and found 2,400 places. As of 1984, the Korean Electric Company established 2 power plants in operation, and three more plants are under

Table 6-9: The Long-term Plan for the Development of New Sources of Energy

	1986	1991	2001	1000 Bbl/Year
Solar Energy				
House Heating(houses)	3,500	60,000	1,5000,000	13,300
Public Facilities(places)	3,000	30,000	1,000,000	3,100
Electric Power(KW)	100	1,000	200,000	450
Methane Gas				
Agricultural Household(houses)	1,000	5,000	30,000	120
Industrial Usage(places)	5	10	50	470
Wind Power(KW)	---	500	7,000	35
Small Hydraulic Power(KW)	8,100	24,200	209,000	2,000
Coal Slurry(m^3/H)	---	1,000	2,000	2,400
1000 Bbl/Year		2,300	23,500	

Source: Ministry of Energy and Resources, ibid., p. 274.

construction by some private companies. To induce further development from private companies, the government has purchased all electricity generated from these facilities.

Biomass: The use of biomass as a source of energy is summarized as an effort to extract energy from methane gas and alcohol. Methane gas is widely used as source of energy in some countries such as China, India, and others in Southeast Asia. Alcohol is also used in Brazil and the U.S. as a source of energy. Korea is in the primitive stage of developing the use of this energy source. A private company, the Lucky Group, is now building 10 plants of methane gas for business purposes. The government projects to spread this system to agricultural areas as a source of household energy.

Coal slurry: Coal can be transformed into a more effective energy resource as technology developes. Current technology makes it possible to transform coal into two other forms; COM (coal-oil mixture), and CWM (coal-water mixture). CWM was not developed before the Third International COM Symposium held by the preside of PETC (Pittsburgh Energy Technology Center) in 1981. But, CWM thereafter has been studied in the U.S., Japan, and Korea, because it can be free from petroleum. The Korean government built a facility for COM study, and continues to elaborate the possibility of practical usage. Some private

companies in Korea are now developing the technological systems to produce the two types of fuels.[23]

As examined above, Korea's capability to substitute fossil fuels like petroleum, natural gas, and coal for other new sources of energy is severely limited, and this trend will continue until at least the year 2001 when the long-term project ends. The share of new sources of energy in Korea's total energy requirements will remain at best 3 percent in the year 2001. This fact means that Korea will not be free from sensitivity and vulnerability to the supply of fossil fuels in the short and mideum term.

Reducing Import Dependence

The changing pattern of burdens on foreign resources in a country's total energy consumption is a clear indicator for evaluating a nation's position in supply security. If a country's dependence on foreign resources is decreasing without any serious effect on its total economic development, and if it maintains a well-designed long-term policy to do that, its security position then would lie in a better situation than the opposite case. One more dimension to be included is the nation's capability to reduce its rate of energy consumption as compared with its rate of economic growth. In other words, if a nation's energy consumption

per unit of real GNP is decreasing, the nation would become less sensitive to supply constraints. In short, these two dimensions lead us to look at a nation's capabilities to increase its domestic resource supply and to use energy resources more efficiently.

As already examined in Chapter 3, Korea's self-sufficiency in energy supply has been significantly reduced since the nation started its first five-year economic development plan in 1962. The rapid economic growth over the last two decades has been associated with the increasing consumption of energy, as is the case with many other industrial countries. While the nation's consumption of energy has increased from 10 million TOE in 1962 to 54 million TOE in 1984, its energy self-sufficiency has dropped from 90 percent in 1962 to 40 percent in 1984. The nation's energy self-sufficiency will drop more in the future. The Ministry of Energy and Resources predicts that Korea's energy self-sufficiency will drop further to 15.3 percent in 1991, and to 10.5 percent in 2001.[24]

This estimation is no doubt, since Korea's domestic energy resource is only available in its anthracite coal reserves which demands heavy works and costs to produce. No petroleum and natural gas have been found in the nation. The reserves of nuclear resources have been found, but their qualities are not conducive to production in economic considerations. Even in the case of coal, the latest productions have not met the nation's level of demands. In

addition, the possibility of substituting fossil fuels for other new sources of energy is minimal at least until the year 2001. Thus, the nation's capability to increase its energy self-sufficiency is severly limited in the current pattern of energy consumption.

To come up with the shortages of domestic energy supplies, Korea has put forth strenuous efforts to find room for increasing self-sufficiency by exploring sources of energy resources in domestic resource bases and by participating actively in overseas resource development. Korea's search to tap oil on the continental shelf was launched in the early 1970s, following a late 1960's ECAFE (Economic Commission for Asia and the Far East) survey on oil reserves in Korean territorial waters. The 2nd ECAFE survey conducted in 1969 estimated that a considerable amount of oil reserves was in the continental shelf including zones located between Korea and Japan. The two oil crises of the 1970s became the catalysts for accelerating the petroleum search in the area between Korea and Japan. Korea and Japan were agreed to prospect oil in the area divided by nine subzones in 1979. This project was carried by several oil companies from Korea, Japan, and the U.S. under a supervisory role from the Korean and Japanese governments.[25] As of 1984, a total of 50,501 line Km of seismic surveys have been conducted, and 11 wildcats have been drilled in the continental shelf. Gas was sometimes discovered in the area, but no economically viable oil field

has been found. With an eye to securing a cheap and stable supply of oil in the long run, however, the Korean government projects to continue this task. Especially in the promising areas, the government will conduct a total of 7,400 line Km of seismic survey and bore 10 exploratory oil wells between years 1984 and 1988.[26]

Other possibilities to increase the nation's self-sufficiency in energy supplies would lie in the development of domestic coal production and hydraulic energy resources. As mentioned above, the nation's capacity to produce coal, mainly anthracite coal, has already reached its maximum level (20 million tons a year). This maximum level is insufficient to meet demand; the government imported approximately 2 million tons of coal in 1984. No bituminous coal reserves have been found in Korea. Furthermore, hydraulic energy resources are poor in the nation. Despite the nation's incessant efforts to develop its hydro power, its share in the total electric power generation remained at only 5 percent in 1984, and it will decrease further in the future.

Influenced by this limitation in the domestic energy resources, the Korean government has rather focused its efforts on stabilizing foreign energy resources. Since the late 1970s, the Korean government has held joint meetings of natural resources cooperative committees with resource-rich countries under a program to step up its involvements in resource development and exploration. Thanks to this

preliminary approach by the government, many Korean private companies have promoted the joint development of mineral resources in 14 overseas projects. This effort is fundamentally done to secure Korea's foreign resource supplies in a long-term basis. In general, a nation's resource supply from foreign countries may take one of four types: 1) direct purchase; 2) trade based on long-term contract; 3) supply in return for investment of capital and technology; and 4) supply in return for direct participation in resource development. It is no doubt that the last two types of supply is more secure for importer than the first two types. The effect of the fourth type in terms of supply security may be almost close to that of domestic supply. Korea as an energy poor nation has expanded its efforts to stabilize foreign energy resources by depending on the last type.

In return for this effort, for the first time in 1982 Korea supplied a total of 270,000 tons of bituminous coal from the mines that Korean enterprises have developed in recent years through their own development projects. The amount increased to 1,270,000 tons in 1983, and in turn to 2,000,000 tons in 1984. The 1984's share of the total bituminous coal consumption was approximately 16 percent. Another possibility for supplying foreign energy resource may exist in the latest effort in Indonesia. KODECO, a South Korean oil drilling company, has drilled several outpost wells in the Indonesian Madura sea in late 1983 to

determine the precise amount of exploitable oil and natural gas reserves there. The company is engaged in a 50-50 joint venture with Pertamina, the Indonesian state-run oil monopoly, to develop oil and gas resources under the seabed. With the successful result from this effort, Korea will supply crude oil in the future for the first time. The government is now projecting to supply 10 percent of the total consumption of oil in the year 2001.

Table 6-10 and 6-11

Although Korea's effort to increase its energy self-sufficiency is comprehensively expressed in both its domestic and foreign resource sphere, it can not curb the increasing gap between the total energy requirements and domestic supplies. As shown above, Korea's self-sufficiency will drop to a 10 percent level by the year 2001. This estimation is based on the governmental report which considered all possible efforts to increase domestic resource supplies, including resource imports attained for the involvement in overseas resource development. Therefore, it is fair to say that much more attention will be paid to the energy security problem in Korea in the future. This attention will penetrate and overshadow its foreign and domestic policy domain.

Table 6-10: Korea's Involvements in Overseas Resource Development (as of 1984)

Resource	Country (Mine)	Involved Company	Korea's share (%)	Invest (Millions$)	Achievements (as of 1984)
Bituminous Coal	U.S. (Tanoma)	Pohang Iron and Steel Co.	100	68.5	*Production from 1982 *Suppling 676,000 tons
" "	Australia (Mt. Thorley)	" "	20	49	*Production from 1982 *Supplying 1,610 tons
" "	Canada (Greenhills)	Hyundai Daisung	20	60	*Production from '83 *Supplying 859,000 tons
" "	U.S. (Ucibelli)	Sunil	Credit Imports	1	*Projecting Supply from '85

Source: Ministry of Energy and Resources, ibid., p. 252.

Table 6-11: Korea's Involvements in Overseas Resource Exploration

Resource	Country (Mine)	Involved Company	Korea's Share(%)	Invest (Millions $)	
Petroleum	Indodesia (Madura/ Adang)	PODECO	50	---	* Discovered Oil Field in Madura in 1983
Petroleum	North Yemen(Mar-ive)	----	----	----	
Bituminous Coal	Indonesia (Pasir)	PIDECO	86.5	7.7	*Obtaining the Permittance in '82.
" "	U.S. (Bering River)	Korea-Ala-ska Dev. Co.	50	7.6	*Test drilling
" "	Australia (Ensham)	Lucky-Kumsung	5	0.4	*Test drilling
Uranium	Canada (Baker Lake)	Daewoo	11	3.3	*Test drilling
" "	Canada (Dawn Lake)	Korean Electric Co.	4.5	3	*Test drilling
Tin	Thailand (Hoi Luang)	Bongcho	40	2.7	*Test drilling

Source: Ministry of Energy and Resources, ibid., p. 252.

On the other hand, Korea's ability to cope with a severe dependence on energy in relation to its economic structure deserves comments from the energy security point of view. Korea's severe dependence is noticeable from a comparison between Korea and other developed countries with respect to the weight of energy consumption in relation to the gross domestic product. For example, Korea's index is 1.38 in the case of 1982 figure, while those of Japan, the U.S., England, and Italy are 0.50, 0.96, 0.78, and 0.58 respectively.[27] Furthermore, the changing pattern of index during the 1973-1982 period says a clear difference between Korea and developed countries. While Korea's index reduced an average of 0.7 percent, developed countries marked 3.5 (Japan), 1.7 (U.S.), 2.5 (England), and 1.9 (Italy) percent respectively. It is obvious that Korea's economy is heavily dependent on energy consumption, indicating an effort to use it more effectively.

Since the nation's industrial structure has moved to the energy intensive industries, the problem derived from the previously noted case may be inevitable. Another factor can break to an effort to reduce Korea's energy consumption. For example, Korea's per capita consumption of energy was only 1.24 TOE in 1983, but in the same year developed countries like the U.S., Japan, and West Germany were 7.28, 2.85, and 4.03 TOE respectively.[28] In other words, Korea's consumption of energy is much behind of the level of developed countries. While Korea's per capita consumption

is rising, developed countries fluctuates around the current level. Thus, it is clear that Korea's pattern is now proving the proposition that economic growth is positively correlated with rising energy consumption.

Efforts to conserve energy consumption are clearly required. Conservation is imperative if the economy is to be kept viable and industry competitive. A viable economy is in turn an essential component of a nation's total security. For this reason, a well-designed conservation program makes an energy deficient country viable in coping with supply constraints and rising costs. This policy is expected to work well especially in the case of energy crisis situations.

As we can see in Table 6-12, the pattern of Korea's total energy consumption has been greatly affected by its economic growth rate and the condition of world oil supply. The first oil crisis reduced Korea's energy consumption in a remarkable way. As the shock of the first oil crisis was released, the nation's energy consumption rose rapidly again to such a higher level as seen before the crisis. The growth of Korea's energy consumption was at a low rate during 1980-82 period, as its economy was in a deep trouble. The rising pattern is on the way due to the beginning of economic growth in the recent experience. As for the energy required per unit of GDP, the index remained at a low level during the 1974-78 period. This pattern broke from 1979 to mark a highest figure in 1980. But, it has been declining

since 1982.

Table 6-12

Table 6-12 implies Korea's performance in terms of energy conservation. The declining pattern from 1973 to 1975 in the increasing rates of both total energy consumption and energy required per unit of GDP was attributed to Korea's conservation efforts. In 1973 the Korean government organized a special supervising group called "Energy Conservation Committee" to come up with the consequences of the first oil crisis. In addition, the government enacted the Law of Energy Conservation in the following year to facilitate legal measures. This action from the government was effective, since Korea's economic growth was not severly damaged as compared to the remarkable achievement in the cuts of energy consumption.

However, this achievement was short-lived as faced with the stabilization of world energy markets on the one hand, and Korea's challenge to heavy-industrial sectors as an economic adjustment on the other. The rising trend in the energy required per unit of GDP began in the latter part of 1970s. This was mainly due to the changing pattern of Korean industrial structure toward heavy industrial sectors. The development strategy of Korea has long been based on an

Table 6-12: The Trend of Energy Consumption

Year	Total Consumption (1000 TOE)	Growth Rate(%)	GDP (billions of Won;1980 con.)	GDP Growth Rate(%)	TOE/GDP (1980 constant)
1973	25,627	14.9	22,754	13.5	1.126
1974	26,087	1.7	24,555	7.8	1.062
1975	26,644	2.1	26,408	7.2	1.009
1976	30,306	13.7	29,760	10.2	1.012
1977	34,371	13.4	32,979	10.7	1.042
1978	38,252	11.3	36,320	9.4	1.053
1979	43,463	13.6	38,952	7.8	1.115
1980	44,115	1.5	37,830	-3.2	1.166
1981	46,052	4.4	40,453	6.2	1.138
1982	45,974	-0.2	42,687	5.6	1.077
1983	49,700	8.1	46,734	9.5	1.063
1984	53,896	8.4	50,437	7.5	1.069

Sources: GDP growth; IMF, International Financial Statistics, 1985, pp. 394-395: Growth of energy consumption; The Bank of Korea, Economic Statistics Yearbook, 1965-1985.

aggressive promotion of the heavy and chemical industries as a critical element in Korea's future industrialization. Among the sectors given priority were basic metals and chemicals, electric and nonelectric machinery, shipbuilding, and electronics. This strategy finally changed Korea's economic structure in such a way that heavy industry dominates other industries. For example, the heavy industry already shared almost 60 percent in the composition of Korean industries in 1981.[29] As a result, the industrial sector rapidly increased its share of the nation's energy consumption from 37.8 percent in 1975 to 43.8 percent in 1980, while the share of consumer, household sector decreased from 45.1 percent to 37.1 percent during the same period.[30]

In 1978, faced with a change toward an energy-intensive structure, the Korean government began to implement a more intensive and comprehensive program to conserve energy consumption. In addition to the legislative and regulatory measures mentioned above, the government established the Energy Management Center which is to undertake technological adjustment, promotion of substitution, research and development, and other commitments necessary for energy conservation. Thanks to these efforts and industrial adjustments to less energy intensive industries, such as machinery and electric sectors, the energy required per unit of GDP has declined since 1981. In 1984, the government expanded its institutional mechanism (the committee for

energy conservation) to other government-led organizations and private industries as well. In other words, the government urged all organizations to establish a committee for energy conservation. Through this effort, the government projects to reduce the weight of energy consumption to GNP by 40 percent from the level of 1983 until the year 2001.[31] In summary, Korea is now struggling to reduce the vulnerabilities resulted from its growing dependence on foreign energy resources and its economic structure deepened by energy-intensive industries. The extent that this struggle can cope with the current vulnerabilities remains to be seen. But, it is fair to say that the Korea's current posture in this concern will not be enhanced by this struggle until the year 2001. The pattern of energy consumption will remain associated to economic growth and the condition of world energy markets. This means that energy security will be a top priority in Korea's policy making community.

Securing Supply Routes

The trade exchanges among nations have increased by the technological advancement in transport systems. The present level of technology provides several types of transport instruments for the exchanges of goods, such as trains, airplanes, ships, pipes, and so forth. The question of

which type a nation depends on for trade business is ultimately determined by many factors which are mainly derived from the nation's geographical conditions. In addition, the protection of trade routes becomes a vital interest for any nation in the currently interdependent world. For a nation heavily dependent on foreign natural resources like Korea, a discussion of supply security can not dismiss the issue of supply route security. This is true simply because of the nation's relatively long lines of transits across the oceans. Although Korea's practice in overcoming its environmental conditions can be cited as a successful case, the country still has a severe security liability behind its success. This point is also applicable to other Asian countries such as Japan, Taiwan, and Singapore. For these countries which are deficient in natural resources, the advantages from environmental conditions are severly restricted by ecological and political settings. The possibility of supplying such resources from neighboring areas is politically restricted. The only choice left for these states is to extend their supply routes across the oceans. Thus, the secure condition of their long sea lanes is virtually a matter of survival for these countries.

In addition to the safety on the high seas, Korea's energy supply must be secured especially in the transit of such chokepoints as the Hormuz and Malacca strait. On the basis of the 1984 statistics, over 50 percent of oil bound

for Korea passes through the Strait of Hormuz; about 90 percent of its oils passes through the Strait of Malacca. The importance of the two straits is clearly more than this, since much of Korea's trade volumes of commodities must pass the straits. For Korea, the secure condition of such chokepoints and high seas is not attainable at its own effort, since the nation has almost nothing to defend its extended sea lanes. The only choice at its best is left in such a indirect way as the military dependence on one of the superpowers, the maintenance of politically cooperative relationships with related countries, and the diversification of supply routes.

In general, threats to the security of these sea lanes may arise from three primary sources. First, they may arise because of a collective failure to confront problems of safety of navigation in maritime narrows. Such problems have come about because of an increase in the size, speed and number of vessels, causing dangers of collision and grounding which can impede normal passage. Second, threats may arise from coastal states which are designed to control freedom of passage in the interests of national security. Finally, threats may arise from naval deployment by an external maritime power, intended to interrupt passage either in maritime narrows or at any suitable point along the extensive routes. In addition to these main threats, a danger to safety of navigation as a secondary threat could occur should an act of piracy get out of hand. Regional

conflict may inflict an unexpected damage to navigating vessels. For example, the war between Iran and Iraq has inflicted severe damage to four Korean vessels prior to 1984.[32]

The Strait of Hormuz: There was a territorial dispute around the Strait of Hormuz by Iran's occupation of the islands located at the entrance to the Persian Gulf. This arose out of British withdrawal from the area and Iran's concern over free access for tanker traffic through the strait. The islands were also claimed by two of the small sheikdoms which are now part of the UAE. In November 1971 agreement was reached with Sharjah to share the island of Abu Musa, but Ras-al-Khaimah was more resistant, and Iran took the Greater and Lesser Tumb Islands by force, with some casualties, on the day after the agreement with Sharjah was signed.[33] The stability of this settlement depends on Iran remaining the dominant military power in the Gulf. But, it seems clear that the strait is unlikely to generate a dispute, since Iran has a commanding position there and her interests favour unrestricted navigation. One may have doubted this optimistic viewpoint on the possibility of closing the strait by a local sovereignty. In fact, emergence of a Marxist government on either side of the Strait (Iran or Oman) might result in a closure the waterway. [34] But, this worry ignores the strategic importance of the Strait in the superpower competition and

the controllability of the United States over the chokepoint. For the United States and its alliances, such a possibility will be too vital to ignore, and it will be coped with at any risk. The so-called Carter Doctrine is a clear expression of such a will;

> An attempt by outside force to gain control of the Persian Gulf region will be regarded as an assault on the vital interests of the United States of America, and such an assault will be repelled by any means necessary, including military force.
>
> President Carter, January 1980 [35]

Thus, a possibility of closing the Strait is more likely as a result of the superpower rivalry. For Korea as an alliance of the United States in politico-military dimension, this means that the dominance of the Soviet Union over the United States becomes a real threat to its oil supply.

The naval presence of the super-powers in the region, though still small, has increased in numbers and quality; the Soviet military presence has risen sharply since 1968, and has been permanent, while the US Seventh Fleet has made occasional visits. The region is less important to them than Europe or the Middle East, but oil gives it strategic significance. Each is there to provide an alternative to the growth of the other's influence and to assure continued

free movement of ships and aircraft. The United States is concerned to assure oil supplies; the Soviet Union additionally seeks to encircle China.

The Soviet naval activities in the Indian Ocean have been more visible than those of the United States. The Soviet Indian Ocean naval squadron has continued to maintain a presence in the region. The squadron consists on the average of 20 to 22 ships, including 3 to 5 surface combatants and a few submarines; the rest are support ships. While the use of facilities in Cam Ranh Bay and Danang, Vietnam, Aden, Yemen and Ethiopia have facilitated deployments in recent years, the size of the Soviet naval presence in the Indian Ocean has decreased somewhat since its peak during the Iranian hostage crisis in 1980. Temporary increases in the size of the Soviet squadron seem to be closely linked to increases in American naval deployments. But, the overall naval deployments have been in the favor of the Soviet Union in Indian Ocean, indicating the nation's strong will in the region.[36]

The threat from the Soviet Union would be a reality in the event of major war. The Soviets possess a formidable mining capability, and the West, for its part, has a relatively poor mine countermeasure capacity. Inasmuch as Soviet access to the region's oil does not depend on transit of the Strait of Hormuz, Moscow would have very little to lose and a good deal to gain by seeding these waters with mines. The United States would not actively respond, since

the security interests of the United States and Western Europe could shift to the Red Sea and the Suez Canal with the completion and possible future expansion of the pipeline between the Gulf port of Ras Tanura and the Red Sea port of Yanbu. For some Asian nations like Japan, Taiwan, and Korea, however, this choice would not be possible because of their geographical locations.

The Strait of Malacca: Passage via the Straits of Malacca and Singapore provides the shortest sea-route between the Indian and Pacific Oceans. An alternative longer route for the deepest draught traffic passes through the Straits of Lombok and Makassar. The distance from the Persian Gulf to the Korean peninsula is approximately 6,500 miles transitting the fromer straits, and 7,500 miles through the latter. Furthermore, whereas the former are de facto international straits surrounded by Malaysia, Singapore and Indonesia, the latter are within the territorial waters claimed by Indonesia, and would subject Korea's lifeline to the policy influence of one country. This factor increases the importance of keeping the Malacca Straits open to Korean vessels.

A formal challenge to the customary legal status of the Straits of Malacca and Singapore was incorporated within a declaration by the coastal states. This declaration had been precipitated by a Japanese initiative within the Sub-Committee of Safety of Navigation of the

Inter-Governmental Maritime Consultative Organization (IMCO), proposing that safety of navigation in the Straits be subject to supervision by an international board of management. In response the governments of Indonesia, Malaysia and Singapore announced on 16 November 1971 that the safety of navigation in the straits was the responsibility of the coastal states concerned. There was less than full agreement, however, over the appropriate legal regime.

The joint statement of November 1971 was prompted in part by a common coastal states' concern over threats to safety of navigation in the straits posed by the increasing size, speed and number of very large crude carriers (VLCC) in passage. Although negotiations between the coastal states over an accord on safety of navigation were protracted, a basic agreement on a voluntary traffic separation scheme, incorporating a limit to under keel clearance for deep draught vessels, was concluded in February 1977. Significantly, there was no attempt to transform the straits into a de facto canal with tolls and compulsory pilotage. [37]

Although the coastal states in the straits successfully arrogated to themselves the right to prescribe in matters of safety of navigation, the net result has served to enhance the security of sea-lanes, with the evident utility of a traffic separation scheme. In the case of supertankers which exceed the stipulated limit for under keel clearance,

the Indonesian Government has encouraged use of the alternative deep water Lombok/Makassar route. In effect, a Japanese VLCC --- the 370,000-dead weight tonnage --- used this route in October 1971 before the coastal states' statement on the Straits of Malacca and Singapore.[38] Thus, a coastal state threat to the security of sea-lanes in South-east Asia can be contemplated only in terms of a worst-case scenario involving radical changes of administration in national capitals --- corresponding, for example, to the Kampuchean experience --- with attendant conflict among regional neighbours. This would not seem to represent a serious possibility in the foreseeable future, given the conservative political identities and external affiliations of states who possess a vested interest in upholding the security of sea-lanes, especially for commercial vessels.

The ultimate threat to the straits is again derived from the activities of the Soviet naval forces. There can be no doubt that the Soviet naval presence in the Indian Ocean has dramatically strengthened by establishing military bases in Vietnam.[39] Yet, it has not altered out of all recognition to the extent that the Soviet navy rules the waves along the sea-lanes between the Indian to Pacific Oceans. Although the United States has been obliged to draw on her Pacific Fleet in order to deploy a carrier task force in the Indian Ocean and faces delay before the return of mothballed carriers to operational service, the present

government shows no sign of abdicating a long-standing naval role in the South West Pacific. For example, in March 1982, Secretary of Defense Casper Weinberger affirmed in Tokyo that "The United States, will, within its means, do as much as is necessary to ensure that the Pacific-Indian Ocean sea lanes remain open for the free passage of trade of all seagoing nations".[40] In the following June, the US Navy conducted joint military exercises with Thai naval forces in the Gulf of Thailand. Of the thirty warships involved, ten were drawn from the US Seventh Fleet in the largest undertaking of its kind for more than a decade. In October, units of Singapore's navy and air force conducted exercises in the South China Sea with ships of America's Seventh Fleet, including the aircraft carrier Midway which then went on to pay a courtesy call at the Thai naval base of Sattahip in the Gulf of Thailand.

The Soviet Union thus does not enjoy naval dominance. Nonetheless, she has placed herself in a position from which she can more readily threaten sea-lanes carrying energy supply should her government have an interest in doing so and if she were prepared to accept the risks and costs which might be involved in such an unprecedented military exercise. What remains to be discussed is the nature of the relationship between an enhanced Soviet naval capability and Soviet intentions. As a global maritime power she has adopted a consistent position on the passage of all vessels through straits used for international navigation.[41] For

example, at the Third UN Conference on the Law of the Sea Soviet spokesmen have demonstrated a determination, in close accord with those of the US, to uphold a liberal regime of passage.[42] This formal position of the Soviet Union may deny the worry over the likelihood of a blockage of the straits by the Soviet naval forces. But, it is more fair to say that it does not make sense to dismiss all worst-case scenarios especially in our turbulent age. The likelihood of such a worst case will be dictated by the overall balance of naval power between the two super-powers and the nature of conflict among nations. In the event of another war in the Korean peninsula, for example, a selective interruption to South Korea's oil supply may be likely by the initiative of the Soviet naval forces.

For Korea facing war-threat, this means that the nation urgently needs a secure route for its oil supplies. No threats from the coastal states are likely since Korea has maintained good relationships with them (Indonesia, Malaysia, and Singapore). But, threats from hostile states like the Soviet Union and Vietnam which are allies with North Korea are highly likely in the event of war. To prevent such a worst case, the primary choice of Korea lies in the management of its alliance cohesion with the United States. The dominant position of the United States in controlling sea-lanes and its strong will to protect its allies are an ultimate resort to Korea's supply security.

The Korea's dependence on the United States to secure

its extended sea-lanes, however, has been endangered by the changing U.S. defense posture. The adjustments of the U.S. defense strategy have resulted in its weakened commitment in the Western Pacific. In other words, the U.S. defense strategy in the Western Pacific is influenced increasingly by contingencies involving the commitment of U.S. forces to the Indian Ocean to defend the oil-rich Persian Gulf region from Soviet attack or to protect the oil fields from local or regional elements hostile to the West. Thus, the U.S. Pacific Command now has operational responsibility for the Indian Ocean and a primary mission of being able to support military operations in the Persian Gulf. This means that the U.S. military capability to defend the Western Pacific is relatively weakened.

Moreover, the U.S. contingency plans have further proposed to swing all U.S. military powers in the region, except those in South Korea, to the Iran-Persian Gulf theater in the event of a U.S.-Soviet ground war there.[43] The additional mission of defending the Persian Gulf means that forces under the U.S. Pacific Command would be spread thin in the even of simultaneous contingencies in the Gulf and the Western Pacific. Against the reactions from the Asian allies, U.S. officials have often promised to dispatch forces from the continental United States to fill any vacuum created by the deployment of forces from the Pacific to the Indian Ocean.[44] It is apparent, however, that the United States would be hard pressed to send forces

to the Western Pacific if it faced simultaneous combat contingencies in Western Europe and the Persian Gulf. According to this changed U.S. defense strategy, the Asian allies would be vulnerable to any contingencies in the Northwest Pacific including the strait of Malacca, since the Persian Gulf would be under the stronger commitments of the United States.

The United States has also put pressure on Japan to assume responsibility for the defense of a large area of the Northwest Pacific at least 1,000 miles out from the Japanese home islands. This zone would encompass the waters between Japan and the Philippines, swinging east from the Philippines to Guam and north from Guam toward Japan.[45] The negotiations of this proposal are now under way between the United States and Japan. For Korea, this changing environment means a reconsideration of its current defense policy. Since Korea has not been a target of the Reagan administration in this context yet, no formal position of the Korean government has been proclaimed about the Japanese broader military role in the Northeast Asia-Northwest Pacific region. But, it is clear that the Korean government would not want to see the revival of Japanese hegemony in the region, because of traditional distrust of the Japanese. If the Japanese government undertakes a broader military role in the region, the Korean government then will have to take a clearer position about the change in such a way as to ultimately support the Japanese role and to minimally

confine the extent of its involvements in the defense of the Pacific Ocean.

The Korean government has strongly induced the United States to concrete its commitments to the Korean peninsula on the basis of the U.S.-Korea Mutual Defense Treaty of 1953, while showing not much attention on the defense of sea-lanes. As long as Japan has a strong responsibility for the defense of the Pacific, Korea will be secured in its sea-lanes for resource imports. For Korea, the concept of a broader Korean defense role including the defense of sea-lanes is complicated by the nation's continued inferiority to North Korea in military balance. It could be counter-productive to finance the assets for broader defense missions out of the existing levels of Korean defense expenditures (6 percent of GNP). The success of the Korea's current strategy will be determined by the nation's efforts to persuade the United States and Japan in the linkage of its heavy burdens on the self-defense.

At the same time, the Korean government has expanded and diversified its diplomatic activities to be on good terms with the developing countries which might interfere with the flow of resource supplies. President Chun's official trip to the ASEAN countries in the summer of 1981 is a good case in point. The purpose of the visit was to increase its economic relationships with five countries, Indonesia, Singapore, Philippines, Malaysia and Thailand. As already mentioned in Chapter Four, the Korea's

penetration into the Middle Eastern countries has been so dramatically proceeded in terms of economic activities. Although the motivation for the Korea's diplomatic expansion to the Third world countries has been less derived from security need for sea-lanes than solution of the nation's overall trade dependence on the United States and Japan, it is no doubt that the Korea's better concern on the Third world countries will be helpful for its security of the passage of strategic chokepoints.

Finally, Korea is expected to do something for the secure resource flows in its own efforts. Policy options, such as diversification of supply routes and relying on a mix of domestic and foreign ships, are also available for Korea. As Table 6-13 indicates, the Korea's dependence on the strait of Hormuz for its oil supplies has significantly decreased since the late 1970s. This result has been associated with the nation's effort to diversify the major oil suppliers. The inclusion of Mexico, Ecuador, and Indonesia in the list of suppliers contributed to the nation's better posture in securing oil supplies. But, the nation's dependence on the strait of Malacca still shows an importance for its oil supplies. For Korea, the dependence on Latin American countries for its oil imports is the ultimate choice to avoid any security liabilities around the the strait of Malacca. The use of the straits of Lombok and Makassar may be a temporal choice to reduce the nation's heavy dependence on the strait of Malacca.

Table 6-13

For its coal supplies, Korea is relatively secure. As the nation has increased its coal imports from three main suppliers, such as the United States, Canada, and Australia, the dependence on the strait of Malacca has decreased to almost negligible amounts. In addition, the Korea's shipping capability by its own flag carriers has dramatically expanded over the last two decades.[46] The share of Korean flag-carriers in the nation's total imports has also increased from 20 percent in 1970 to 50 percent in 1981. From the security point of view, it is recommended that Korea should not depend too much on its own flag-carriers, since they can be a target of the Soviet attack in the oceans. Thus, Korea's shippings currently show a stable balance in this regard.

This chapter has been provided to review and evaluate Korea's performance with respect to energy security. As already shown in the foregoing analysis, Korea's comprehensive effort to secure its energy supply was not prepared until the late 1970s when the Ministry of Energy and Resources was established. The creation of the ministry

Table 6-13: Energy Transit and Shippings

A. Energy Resource Imports/Transit Chokepoint (in percent)

	Coal	Oil	
	Malacca/Singapore	Malacca/Singapore	Hormuz
1978	5.4	100	100
1979	13.5	100	99.4
1980	2.4	100	98.2
1981	0.7	97.5	93.3
1982	1.6	92.8	75.5
1983	1.5	91.8	68.4
1984	1.0	90.6	52.4

Source: Based on Economic Planning Board, Korean Statistical Yearbook, 1977-1985.

B. Imports Carried/Total Imports (in percent)

	Korean Merchant Ships	Foreign Ships
1970	20.2	79.8
1975	31.2	68.8
1976	38.2	61.8
1977	47.8	52.2
1978	47.8	52.2
1979	47.8	52.2
1980	50.3	49.7
1981	50.4	49.6
1982	49.7	50.3
1983	47.4	52.6
1984	46.9	53.1

Source: Office of Customs Administration, Statistical Yearbook of Foreign Trade (in Korean), 1985, p. 365.

has steadily shifted the structure of the nation's energy supply in such a way as to enhance its security position. Despite its late start, in some measures like diversification of suppliers and stockpiles, Korea's performance is considered as outstanding. At the same time, it should be recognized that Korea is far from the attainment of a complete security position in measures such as increasing self-sufficiency and securing supply routes. The nation's policy option to reduce the vulnerabilities resulting from the two issue areas by its own effort is ultimately out of the question. Thus, it is inevitable that the nation should depend on developed countries for technological and military supports.

Footnotes

1. During the first oil crisis, the United States foreign policy was almost stimulated to intervene militarily in the Middle East. Kissinger termed the action "strangulation" of the Persian Gulf by its military forces. Along the same line, President Carter called the second oil crisis "a clear and present danger to our national security", indicating a possibility of using military forces. See Joseph S. Nye, "Energy and Security", in Charles W. Kegley, Jr. and Eugene R. Wittkopf, The Global Agenda (New York: Random House, 1984), p. 327, 334.

2. Three literatures were included in the review: Nobutoshi Akao, "Resources and Japan's Security", in Nobutoshi Akao, (ed.), Japan's Economic Security (New York: St. Martin's Press, 1983), p. 15-45; Hans H. Landsberg and John E. Tilton with Ruth B. Haas, "Nonfuel Minerals", in Paul R. Portney, (ed.), Current Issues in Natural Resource Policy (Washington, D.C.: Resource for the Future, Inc., 1982), pp. 74-116; Bruce Russett, "Dimensions of Resource Dependence: Some Elements of Rigor in Concept and Policy Analysis", International Organization, Vol. 38, No, 3 (Summer 1984), pp. 481-499.

3. The other oil companies are Honam Oil refining Company (in a joint venture with Caltex), Kyong-In Energy Company (in a joint venture with Union Oil of the United States), Kuk Dong Oil Co. Ltd. (in a joint venture with Royal Dutch Shell), and Ssangyong Oil Refining Co. (in a joint venture with the National Iranian Oil Corp.). These companies were built in the form of private entrepreneurships with an aid from one of the foreign oil companies, as the Korean government had planned to do. See Dong-sung Cho, International Resources: Centering on the Oil Problems, (in Korean), (Seoul, Korea: Bakyoung Sa, 1981), pp. 215-225.

4. The preference of D-D base by supplier countries may be legitimized for the following reasons: 1) The G-G base would make importers work for their stockpiles in such a way as to dismantle suppliers in price controls; 2) D-D base would make suppliers control their supplying policies in a more secretive way; 3) D-D base would be more profitable. See Dong-Sung Cho, ibid., pp. 262-263.

5. Dong-A Ilbo, Dong-A Annual Statistics, (in Korean), 1982.

6. Ministry of Energy and Resources, The Long-term Strategy of Energy Supply Toward the Year 2000. 1985, p. 241.

7. This position is similiar to the application of the so called "Hallstein Doctrine" in its foreign policy behaviors. The term "Hallstein" was derived from the name of the late

German Chancellor Konrad Adenauer's vice-minister of foreign affairs. The doctrine was official West German policy from 1954 to 1969. See Youngnok Koo, "The Conduct of Foreign Affairs", in Edward Reynolds Wright, (ed.), Korean Politics in Transition (Seattle and London: University of Washington Press, 1975), pp. 212-213.

8. It would be incorrect to assert that Korea's political position is of no importance to the countries of the Middle East, but it is certainly quite clear that Korea's economic position is of greater importance. In fact, this new Korean-Middle East relationship, based on mutual economic needs, has paid great political dividends to South Korea, so that today it is Seoul that holds the diplomatic and political lead over Pyongyang in the region. On this point, see R.D. McLaurin and Chung-in Moon, "A Precarious Balance", Korea and World Affairs, Vol. 8, No. 2, (Summer, 1984), pp. 235-243.

9. The index was originally introduced by Mr. Yoneda Kimimaru of the Institute of Developing Economics. Bobrow and Kudrle applied the index to analyze Japan's performance with respect to energy supplies. See Davis B. Bobrow and Robert T. Kudrle, "Western Theory and Japanese Practice: A New Geopolitics", A paper presented at the XIIIth World Congress of the International Political Science Association, (July 1985), pp. 15-16.

10. For the financial support, the act set up a National Defense Stockpile Transaction Fund to receive proceeds from sales, which are then available for purchases, subject to congressional appropriation procedures. Management is in the hands of two agencies: the Federal Emergency Management Agency, which is in charge of policy and planning, and the General Services Administration, which does the buying, selling, and maintenance of the stockpile commodities. For the process and history of stockpiling in the United States, see Hans H. Landsberg and John E. Tilton with Ruth B. Haas, "Nonfuel Minerals", op. cit., pp. 103-106; Rae Weston, Strategic Materials (New Jersey: Rowman and Allanheld, 1984), pp. 149-155.

11. The most potent arguments against stockpiles are as follows: 1) Unless continuously reviewed and changed in composition, they age quickly, so that when needed they fail to fit altered demand conditions; 2) Releases made to adjust the composition of the stockpile to changing needs incidentally affect market prices and may depress domestic production; 3) Government may use it for reasons other than emergencies. Hans H. Landsberg and others, "Nonfuel Minerals", op. cit., pp. 103-104.

12. Dong-A Ilbo, Dong-A Annual statistics, 1979-1985.

13. Until 1981 Korea's stockpiles were known to public in specific figures, but they have not been known in specific figures since the 1982 when the governmental stockpiling started. Thus, the estimation in this study was made on the basis of a contextual reading of some related governmental publishings: MCI, A Handbook of Korea, 1983; Ministry of Energy and Resources, The Long-term Strategy of Energy Supplies toward the Year 2000, 1985.

14. The IEA aims include 1) providing security against new oil embargoes through cooperation to build and share oil stocks; 2) sharing equitably among industrialized countries the cost of and responsibility for energy conservation; 3) stimulating alternate energy source development. The goal is a ninety-day reserve supply of oil and coordinated conservation moves to ease consumption. Harry Clay Blaney III, Global Challenges: A World at Risk (New York: Franklin Watts, 1979), pp. 82-86.

15. The Federation of Korean Industries, Korean Economic Yearbook, 1980, 1985 issues.

16. Among other things, the governmental support to coal industry has been remarkable in subsidies. For example, the governmental subsidies have increased from one billion wons in 1972 to eighteen billion wons in 1983 with an annual average increase rate of about 40 percent. The Federation of Korean Industries, Korean Economic Yearbook, various issues.

17. Ministry of Energy and Resources, op. cit., pp. 203-206. The report predicted that the production of coal will decline from 1987 when will be the peak in coal production (20 million tons).

18. Korea spent almost eight years to build the first nuclear power plant. The government took over this commission to both domestic and foreign industrial companies. The Westing House of the United States and GEC of the England took the technological construction and the domestic companies, Hyundai and Tong-A, were committed to work for other facilities. Dong-A Ilbo, Dong-A Nyungam, 1979.

19. The distribution of world natural gas is described as follows: Communist world (42%), Middle East (26%), North America (10%), Latin America (6%), Africa (6%), and Asia (5%). International Petroleum Encyclopedia, 1983.

20. Natural gas must be liquified in the shipping country by cooling it to -161 centrigrade, a process that uses up one-quarter of the amount of energy in the gas. Natural gas tankers then carry this volatile liquid to ports in the importing countries. Any rupture of the gas liquid

container could release a plume of lethal gas, as the liquid would rapidly gasify and expand to fill its original volume. The cost of the new facilities is also staggering. See Dennis C. Pirages, Global Ecopolitics (North Scituate, Massachusetts: Duxbury Press, 1978), p. 118.

21. Ministry of Energy and Resources, op. cit., pp. 141-144.

22. This project involves many groups from government and private industries: the Ministry of Science and Technology and the Ministry of Energy and Resources from the government; Samsung Electronic, Lucky-Kumsung Communication, Hyosung Heavy-Industrial from private companies; the MAN Company of West Germany from foreign company. The Ministry of Energy and Resources, The Long-term Strategy of Energy Supply Toward the Year 2000, p. 270.

23. CWM will be produced by the Korea Oil Corporation from 1988. In addition, Korea Textile Company is now establishing a production system for COM for commercial purpose. The Ministry of Energy and Resources, ibid., pp. 271-272.

24. In fact, the report estimated Korea's energy self-sufficiency more pessimistic than this study in 1983 figure. While this study expressed 42 percent, the report estimated 25 percent. The Ministry of Energy and Resources, ibid., p. 44.

25. Private companies that involved in this project were Texaco, Zapex, KoAm from the United States, Nippon Petroleum, Teikoku Petroleum from Japan, and Korea Petroleum Development Corp (PEDCO).

26. Korea's search for oil in this area is not limited in the joint efforts with Japan. For example, Korea has an exclusive zone (Bloc 4) to explore oil in the area. The drilling site, picked on the basis of seismic surveys, is between 30 degrees 30 minutes and 32 degrees north latitude and between 125 degrees 30 minutes and 126 degrees cast longitude. The joint concessionaire of the zone, Zapex of the United States financed the drilling. The United States offshore drilling company entered into a joint venture agreement with Korea Petroleum Development Corp (PEDCO) in 1981 to develop undersea oil resources on a production-sharing basis. Yonhap News Agency, Korea Annual, 1984, pp. 156-157.

27. This index resulted from a calculation under a constant of 1975 figure. In addition, it is interesting to see that while Korea's consumption of energy increased an average of 6.1 percent during the 1973-1982 period, developed countries remained at the level of less than 1 percent except England

marking 1.6 percent. The Ministry of Energy and Resources, op. cit., pp. 89-90.

28. It is remarkable to see that developed countries during the 1972-1983 period fluctuated around the current level in their per capita energy consumptions. But, Korea's case showed an increasing pattern, marking 100 percent increase in the same period. The Ministry of Energy and Resources, op. cit., p. 93.

29. The Korea's plan to move its economic structure toward heavy industry embarked in the early 1970s. A long-term perspective plan covering the decade to 1981 was published by the Economic Planning Board (EPB) in 1973. While not abandoning export growth as a major source of industrial development, this plan promoted the accelerated development of the heavy and chemical industries. But, this plan began to be extensively applied from the latter part of 1970s, since Korea's comparative advantage still lied in the light industries until the period. Parvez Hasan and D.C. Rao, Korea: Policy Issues for Long-term Development (Baltimore and London: The Johns Hopkins University Press, 1979).

30. The Federation of Korean Industries, Korean Economic Yearbook, 1976-1984.

31. Ministry of Energy and Resources, op. cit., pp. 95-100.

32. The accidents cited above happened during 1982-84 period. Dong-A Ilbo, Dong-A Annual Statistics, 1985, p. 188.

33. Barry Buzan, "A Sea of Troubles: Sources of Dispute in the New Ocean Regime", in Jonathan Alford, (ed.), Sea Power and Influence (Montclair, New Jersey: Gower and Allanheld, 1980), pp. 189-190.

34. This possibility is emphasized by Robert J. Hanks and Alvin J. Cottrell. They conclude that local threats to the waterway are a real possibility, after reviewing the Oman's political instability and the uncertain future of the Iranian revolution. "The Strait of Hormuz: Strategic Chokepoint", in Alvin J. Cottrell, Sea Power and Strategy in the Indian Ocean (Berverly Hills, California: Sage Publications, 1981), pp. 101-110.

35. Frans R. Bax, "Energy Security in the 1980s: The Responses of US Allies", in Donald J. Goldstein, op. cit., p. 34.

36. The comparison between the US and the Soviet Union in the naval deployments indicates the Soviet dominance over the US by approximately 3:1. See Stuart E. Johnson and Joseph A. Yager, The Military Equation in Northeast Asia

(Washington D.C.: The Brookings Inc., 1983); Min Yong Lee, The Political and Strategic Analysis of the Growing Soviet Naval Capability, (in Korean), (Seoul Korea: Korea University Press, 1981), pp. 101-103; Shahram Chubin, "American Security Interests in the Persian Gulf", in John F. Reichart and Steven R. Sturm, (eds.), American Defense Policy (Baltimore and London: The Johns Hopkins University Press, 1982), pp. 284-285.

37. The traffic separation scheme with some modifications was endorsed by the IMCO Assembly in November 1977. It became operational on 1 May 1981. It is of interest to note the role played by the Japanese Government and private bodies in the scheme by financing and conducting hydrographic surveys and by providing navigational aids. Michael Leifer, "The Security of Sea-Lanes in Southeast Asia", In Robert O'Neill, Security in East Asia (New York: St. Martin's Press, 1984), p. 168.

38. There was a measure of reluctance to use this route on the part of Japan. But, security considerations in respect of passage through Indian Ocean internal waters have been a lesser consideration than the cost of the additional sailing time involved. Michael Leifer, ibid., p. 169.

39. The Soviet naval bases are known to be held at Cam Ranh Bay and Da Nang. It was reported that the Soviet Union had stationed nuclear-powered attack submarines in the South China Sea. In addition, Soviet use of the airbase at Da Nang, if primarily for reconnaissance purposes, indicates a further potential for anti-ship operations. The expansion of the ports at Kompong Som and at nearby Ream in Kampuchea on the Gulf of Thailand reinforces capability for the projection of naval power. Michael Leifer, "The Security of Sea-Lanes in Southeast Asia", op. cit., p. 170.

40. Address to the National Press Club of Japan, 26 March, 1982.

41. "In international law, it is normally assumed that straits which connect open seas and are of importance to world sea routes should be open for general use. Passage of merchant vessels and warships through these straits is not restricted since their legal regime is based on the principles of freedom of the high seas". P.D. Boraboly et al. Manual of International Maritime Law, Part I (Moscow: Military Publishing House of ministry of Defense, 1966), p. 155 (translated by the Department of the Navy, Washington, D.C., June 1968).

42. Michael Leifer, op. cit., p. 172.

43. The New York Times, May 30, 1982. Summary of the Defense Department's "Fiscal Years 1984-1988 Defense

Guidance" document.

44. The so-called "Swing Plans" could involve the shift of the U.S. aircraft carriers with the Seventh Fleet, the U.S. Marine Division on Okinawa, the three squadrons of F-15 fighters on Okinawa, the B-52's on Guam, and the two squadrons of F-4 fighters in the Philippines. See Larry A. Niksch, "South Korea in Broader Pacific Defense", in Journal of Northeast Asian Studies, Vol. 2, No. 1 (March 1983), pp. 92-93.

45. Secretary of Defense Weinberger indicated to the Japanese in March 1982 that the Japanese government should develop a larger defense force structure than expressed by its own program, including a destroyer force of 70 vessels and four squadrons of F-15 fighters. Larry A. Niksch, ibid., p. 94.

46. At the end of 1984, Korea had approximately 7.7 million gross tons in various vessels. This figure is considered the 12th or 13rd in the world. As of 1984, 132 ocean-going vessels were put on the nation's international sea routes, including 34 vessels on the North American routes, 5 on the European-routes, 11 on the Middle East routes, 26 on the Southeast Asian routes and 48 on Korea-Japan routes. Korea Annual, 1985, p. 159.

CHAPTER SEVEN

CONCLUSION

Summaries of Findings

This study began with some questions about growing ecological constraints and their implications for the security of national populations with special attention to developing countries. Most contemporary countries have experienced tremendous increases in demand for critical natural resources as a result of the Industrial Revolution. Although the contemporary developed countries have increased their carrying capacity through technological sophistication and foreign resource supply, most developing countries have constantly faced severe crises because of failures to cope with ecological pressures. Developing countries must avoid the imminent problems stemming from uneven ecological developments.

In dealing with the resource problems of developing countries, this study depended on the presumption that many developments arising from and related to ecological pressures necessitate attention to national security concerns. It can be argued from this premise that national governments are primarily responsible for the adequate supply of vital natural resources. The recognition of

resource problems as national security agenda has policy relevancy for most developing countries which have already been plagued by various forms of ecological disasters.

This study has concentrated on South Korea to facilitate a discussion of national policy responsibility for the supply of vital natural resources, such as food, energy, and non-renewable minerals. In focusing on South Korea, this study has explored two major concerns; the way of enhancing its carrying capacity and the security position of the nation's foreign resource supplies. South Korea's resource problems were revealed right after the division of the Korean peninsula. The two Koreas are ecologically interrelated as a resource base; industrial resources of North Korea and food resources of South Korea. The division of the Korean peninsula destroyed the ecological interrelatedness between the two regions. It gave South Korea less than half the land, about two thirds of the population, and very little of the industrial bases. As a result, South Korea's economic conditions possessed all the familiar characteristics of extremely underdeveloped countries until the early 1960s.

Since the early 1960s, however, South Korea's carrying capacity has rapidly increased through the expansion of foreign trade. The nation's domestic capacity to supply natural resources has steadily increased, but it has not been sufficient to meet the nation's growing demand. South Korea's self-sufficiency in the total grain and energy

supplies remains at below 50 percent as of 1984. The self-sufficiency of non-renewable resources is much lower than food and energy resources, as examined in Chapter Three. The chapter also indicated that Korea's dependence on foreign natural resources will be growing further, since population growth is relatively high and the direction of industrialization still remains at resource-intensive industries.

South Korea's increasing dependence on foreign natural resources should be accompanied by the nation's increasing capability to earn foreign exchanges. As a nation deficient in natural resources, South Korea's only choice to come up with its resource imports is to export manufactured goods. Until the mid-1970s, exports of light manufactured commodities, such as textiles, wearing apparel, and shoes, to U.S. markets were main sources of the nation's foreign exchange earnings. The nation's balance of trade was in chronic deficit until 1984. This deficit has been covered by the dependence on foreign capital. Recently, the nation's growth rate of exports has increased faster than that of imports. Consequently, the problem of balance of payments will be favorably solved, if the current success continues.

As the examination of the nation's foreign trade structure revealed in Chapter Four, however, Korea should overcome the problems of sensitivity and vulnerability. In export side, Korea is heavily dependent on two partners, the

United States and Japan. In addition, the nation's export items are vulnerable to the rising protectionism in its major trade partners. These problems have recently caught Korea in various kinds of discriminating actions mainly from the United States and Japan. To handle these negative results, Korea has embarked many strategies, such as adjustment of industrial structure, market diversification, and bilateral bargaining. The extent of the nation's success in these measures will determine the stability of its overall foreign trade performance.

South Korea's success in supplying foreign natural resources has been possible by satisfying other necessary conditions. The international economic order was shaped in such a way as to guarantee the full benefits of free trade. As a result, access to foreign natural resources in international politics became more open and secure. By integrating its economy into the world economic system, South Korea could enhance its resource position throughout the dramatic expansion of foreign trade.

The examination of the current international environment and South Korea's foreign trade structure revealed that the nation's ability to supply natural resources is not as optimistic as in the past. This observation in turn led to an attempt to evaluate the nation's security position in some vital commodities selected from food, energy, and non-fuel minerals. In Chapter Five, the criticalness of the nation's dependence of

eight commodities on foreign countries was measured. The results of the chapter are helpful in understanding the nation's supply conditions for each commodity and in indicating the most vulnerable type of natural resources.

The analysis of South Korea's foreign resource supplies in terms of a multidimensional measure of dependence indicates that the supply conditions of the nation are not considered as critical as one might fear of dependence originating from the simple measurement, import percentage of a nation's total consumption. Korea's profiles by this measurement, for example, are considered critical, since all commodities with an exception of coal are currently well over 70 percent level. The consideration of other conditions, however, generally mitigates the criticalness resulting from the first measurement. In more specific terms, the criticalness of Korea's grain and non-renewable mineral supplies is mitigated by the good profiles of other conditions. But, the criticalness of the nation's petroleum dependence is not mitigated by other conditions. The importance of petroleum to the nation's economy and energy supplies, the concentration of major suppliers to the Middle East, the high likelihood of global depletion, and the political instability of suppliers further deepen the criticalness of the nation's dependence of petroleum. It is also inferred from this analysis that Korea is most critical in supplying its energy resources, since petroleum is the main source of the nation's energy supplies (almost 60

percent).

The evaluation of a nation's supply security must involve other sufficient conditions which are mainly related to the nation's capability to secure its resource supplies. Five policy options were developed in the beginning of Chapter Six: stabilizing relationships with major suppliers, stockpiles, diversification of resources, development of domestic resources, and securing supply routes. These policy options were in turn applied to the examination of Korea's performance with respect to energy supplies. We found that Korea has recently enhanced its position of energy supplies by securing its relationships with major suppliers and diversifying its suppliers and sources of energy. But, the vulnerability was also found in reducing foreign resource dependence and securing its supply routes. South Korea is not capable of enhancing security in these two dimensions by its own means. This outcome is sufficient to conclude that the supply security of Korea with respect to natural resources is inherently limited in attainability.

National Security Implications

The contribution of this study with regard to national security can be found in an attempt to deal with new sources of threats. The theoretical perspective of this study is to incorporate threats from non-military dimensions into a framework of national security. Criticizing the

conventional approach which tends to define national security merely in military terms, a more broad perspective was introduced to include all possible threats to the security of a nation. The concept of national security can be defined as the absence of severe threats to national core values. There are supposedly multiple values a nation state should maintain, but in general they must include three goals: the protection of political autonomy, national sovereignty, and the physical well-being of national population.

This study tried to relate the implications of ecological problems to national security. The importance of the adequate supply of vital natural resources qualifies as a national security issue in the sense that it directly affects one of the three goals, the physical well-being of national population. But, its importance to national security is much more than this. Indirect effects of supply disruptions to two other basic goals, the maintenance of political autonomy and national sovereignty, become salient when a nation should import large quantities of natural resources to sustain its population at any given time. The need to import natural resources implies dependence. The values of autonomy and sovereignty are inevitably constrained when resource imports are irreplaceable supplies critical to sustaining a nation's economic and ecological survival.

The traditional security threat emanating from a

nation's ecological dimension is expressed in an array of ecological disasters, such as poverty, malnutrition, and starvation. These threats result from failures to satisfy resource demands internally, especially under circumstances of overpopulation. Our brief examination of Third World countries in terms of the relationship between availability of resources and population dynamics in Chapter One revealed that population pressure beyond their carrying capacity has been one of the main factor for their deteriorating ecological environment.

The issue of resource scarcity also impinges upon national security for developed countries. Traditional ecological threats are not seen in most developed countries, since they have increased their carrying capacity by technological and foreign trade options. However, the resource consumption of most developed countries is currently well beyond their domestic resource base. This condition has introduced the issue of supply security as a new agenda item on their lists of national security concerns. Other issues, such as pollution problems, fear of nuclear disaster, and competition for new resource bases, also become new security agenda items for developed countries. But, an immediate and critical agenda is to secure their access to foreign natural resources. In other words, the sustainability of their current level of economic and ecological development is fundamentally swayed by the extent of success they can attain in terms of supply

security.

The issue of supply security must be treated as a new agenda item for South Korea's security. Currently, Korea's dependence on foreign countries for the supply of natural resources, such as food, energy, and non-renewable resources, is critical when evaluating their imports as a percentage of total consumption. Any supply disruption of these resources can easily provoke economic and ecological chaos for the physical survival of the national population. As identified in Chapter Two and Four, various types of supply disruptions are likely in the current international environment; unpredictable supply cutback caused by political instability of suppliers, embargo, global depletion, a sharp price rise, sabotage of sea lanes, and so forth. The impact of a supply disruption can be hardly limited on the nation's economic and ecological dimension. The spill-over effects of a supply interruption to the nation's military security dimension would be large. Economic and ecological deterioration resulting from a supply threat would enhance the possibility of political instability, which could in turn trigger North Korea's aggressive behavior.

Moreover, the direct consequences of a supply disruption on the nation's military strategic performance can be significant. Apart from the military strategic equation between the two countries, North Korea has a clear advantage in its supplies of strategic resources that are

the Achilles' heel endemic to South Korea. South Korea's natural resource shortage will damage its operational power in the event of war. In the initial upheaval of war, North Korea seems far less likely than South Korea to be caught short of supplies for maintaining the civilian infrastructure needed to support a war effort. North Korea's resource dependence is limited to a small amount of petroleum. Its reliance on relatively abundant domestic coal resources (the North has a six-fold advantage over the South in coal reserves) takes much of the edge off its dependence on oil imports. For example, North Korea imported only 2,250,000 tons of coal in 1980, which is approximately 8 percent of South Korea's import. North Korea's oil supply is secure, since the major suppliers are its major military allies, the PRC and the Soviet Union. This means that North Korea would benefit from its logistical advantage in another prolonged war.

South Korea's long supply lines are extremely vulnerable to sudden interruptions on the sea-lanes, as reviewed in Chapter Six. South Korea's current oil stockpiles are enough to endure only 40 to 50 days. Even though its military operations may be possible by concentrating domestic resources on military purposes, it would be inevitable that South Korea has to meet civil disruptions by resource shortages. This condition suggests that South Korea should project its strategic planning on the basis of a rapid termination of war. To do otherwise

would significantly weaken South Korea's strategic power, as shown in the case of the Vietnam War. South Korea's economic system is also more vulnerable than North Korea in its capacity to absorb war damages. In the event of another stalemate, the devastation produced by war would likely leave South Korea's complex economy irreparable.

South Korea is an extreme case in which the supply security as a national goal encompasses all of national security values. Other developed countries may have a less critical resource dependence as it relates to national security than does South Korea. Resource dependence is likely to receive more attention as a part of national security as demand for some essential resources increases and supplies appear more precarious.

Another major implication drawn from this study is the establishment of a more rigorous set of dimensions by which to measure resource dependence when evaluating the supply security of a nation. The attempt to measure dependence was to satisfy our main proposition deduced from an examination of the phenomenon of interdependence in Chapter Two: the necessary condition of a nation's vulnerability with regard to resource supply can be expressed in the criticalness of dependence; but, of great significance is the varying ability of a nation to cope with supply interruptions. In other words, the sufficient condition of a nation's vulnerability lies in the weakness of its domestic coping mechanism.

The analytical framework suggested in Chapter Five was established in an awareness that fears of dependence in resource deficient countries arise from several possible supply interruptions. Reflected by the five types of supply threats identified in Chapter Two, we built a multidimensional measure of dependence which constitutes seven elements. It must be recognized that we need to consider other elements and measurement strategy to make a more refined and logically sound framework. But, the analytical framework employed in Chapter Five can be applicable to the analysis of other countries to evaluate the seriousness of their supply conditions. Such a framework can also contribute to the revelation and the judgement of a nation's profile of dependence in the various types of resources.

Policy Implications

The policy implications derived from this study can be narrowed down to two major concerns. The first concern is related to the questions of coping with ecological disasters especially for developing countries. The examination of Korea's case throughout Chapter Three and Four may suggest a model for developing countries with regard to the enhancement of national carrying capacity. Korea's ecological profile is no better than many other developing countries. While the nation's population is heavily loaded,

its resource base is severely deficient in food, energy, and other non-renewable resources. In this sense, the nation's current success in accessing foreign resources can be considered remarkable. This success is chiefly attributed to the nation's aggressive involvement in the international trade system.

There has been a critical debate over the possibility of developing countries' using profitably the potential of international trade. International trade is not considered promising for developing countries among dependency theorists. This conclusion is derived from the belief that trade exchange between developed and developing countries is often bound to be unequal, and this inequality can be an instrument of domination for the powerful. The opposite point of view can be seen among advocates of neoclassical trade theory; international trade is an instrument not simply of mutual advantage but an instrument for reducing international disparities. These two extreme positions do not suggest a viable policy option for developing countries in avoiding their impending resource problems. When considering the high population growth prevalent in developing countries, strict adherence to dissociation and self-reliance as a development strategy is not promising. National populations cannot live in complete isolation in the contemporary international system. The countries which are often considered to have a radical form of self-reliance, such as North Korea, Cuba, and Tanzania, also

import their vital resources in shortage. Their dependence on Soviet Union in political and economic dimension has been salient. On the other hand, foreign trade has already played an important part in the development of many Third World countries, and its advantages should not be underestimated.

Although the advantages of international trade are obvious, heavy dependence on foreign trade in a nation's economy must also be checked by the resulting security problems related to sensitivity and vulnerability syndromes. Korea's case provides a rationale for this warning. The nation's aggressive involvements in foreign trade have entailed unexpected negative effects leading to major vulnerabilities in the supply environment, and the economic and political stability. In other words, the national economy is closely tied to the turmoil and disturbances originating from international economic conditions. This relationship is expressed by the fact that more than 70 percent of Korea's GNP is derived from trade activities. As revealed in Chapter Four, the structure of Korea's foreign trade has built-in vulnerabilities originating from the heavy concentration on two big countries, the United States and Japan, for export and foreign capital, and the ever-growing demands for foreign natural resources. There are strategies to manage this vulnerability, but they are often costly to the nation's autonomy and political stability.

For the Third World countries, a moderate position should be taken in development policies. From the point of national security perspective, the cases of Korea and many other less developing countries are not considered promising in dealing with ecological pressures. While Korea's problem is in its heavy dependence on foreign natural resources, many other developing countries lack in accessability to foreign natural resources. Foreign trade as an instrument to increase carrying capacity must be assessed in more realistic terms, considering both its benefits and drawbacks to national security.

The second concern is related to the policy techniques for securing foreign resource supplies. The policy options this study identified in Chapter Six are generally feasible for the weaker state or any other state that avoids military actions for supply security. They involve stabilizing relationships with major suppliers, ensuring stockpiles, developing alternative sources, reducing import dependence, and securing supply routes. It seems realistic to include the possibility of using military force in ensuring resource supply. This alternative may be a tempting agenda for major states with strong military power, although it has not been considered an effective mean for resource provision since 1945. The scope of this study eliminates the consideration of a military option, since this alternative is no longer a concern for such a weaker actor like South Korea.

The five policy options based on non-military means have

recently been perceived vital by the Korean government, especially for its energy supply. The extent of success the nation has achieved is moderate as compared with other developed countries, such as Japan and West European countries. The Korean government should place more emphasis on the implementation of these policies for its energy security, since the supply of energy resources is the most urgent problem. It should be also recognized that the same policy options should be extended to the supply of food and non-renewable minerals.

First, Korea should continue diversification of suppliers for its natural resource imports. This policy is urgently necessitated for its grain supplies, since Korea is heavily dependent on the United States. It is currently doubtful that Korea faces any supply interruptions from the United States. Moreover, the bilateral economic relationships between the two countries are not favorable for Korea to reduce its grain imports from the United States. However, the supply pattern of Korea's grain imports is hardly considered as diserable from the security point of view. Although Korea is better situated in energy and non-fuel mineral imports, it has to reduce further its dependence on the Middle East for oil imports. Southeast Asia and Latin America are alternative regions for Korea in terms of supplier diversification.

Second, ensuring stockpiles is an significant policy goal for Korea, not only for its economic security, but for

its military strategic importance. The Korean government has placed its policy emphasis on stockpiling energy resources since the second oil crisis. For stockpiling oil, the government has commited primary responsibility to private oil companies. The government also has its own programme for stockpiling oil. Despite its late start, the nation's stockpiles of oil reached 50 days' consumption as of 1984, of which the governmental stockpiles are estimated as approximately 20 days' consumption. The Korean government also stockpiles coal in preparation for emergency. Korea's coal supply is much safer than oil supply, since the stockpiles of coal reached almost five months of consumption. However, not much policy attention has been paid for grain and non-fuel mineral stockpiles in Korea. In fact, there has been no clear policy guidelines identified for stockpiling those commodities in the Korean government. This policy ignorance is cautioned when considering the nation's increasing import dependence of grain and non-fuel minerals.

Third, the supply conditions of oil draws the Korean government to develop alternative sources of energy, since oil reserves are in the shortest supply of all natural resources. The policy items include an expanded use of other energy sources, and the development of new sources of energy. The Korean government has tried to reduce the nation's reliance on oil by urging the consumption of coal, gas, and nuclear energy. As a result, the pattern of

Korea's energy consumption has moved to a reliance on multiple dimensions of energy resources since the late 1970s. The government has started a comprehensive effort to develop new sources of energy, but the nation's capability to substitute fossil fuels for other new sources of energy will be severely limited until the year of 2001. This means that Korea will have to depend on the foreign supplies of fossil fuels in the short and medium term. Korea's choice to overcome its energy dependence is to develop nuclear energy. The government has promoted the installation of nuclear power plants as a way to reduce oil dependence. Three nuclear plants were operational in Korea and the government is now building six more nuclear plants. There exist dangers and vulnerabilities associated with this nuclearization plan. Such a massive nuclearization plan may cause a threat to national security because of the lack of safeguards. Thus, energy problem arrests much attention to national security for Korea.

Fourth, the Korean government has to prepare for a long-term plan to reduce its dependence on foreign natural resources. Korea's self-sufficiency in food, energy, and non-fuel minerals has been significantly reduced over the last two decades. As the government predicts, the nation's energy self-sufficiency will drop further to almost 10 percent in 2001. The prospect for food and non-fuel minerals is no better than that of energy. This trend is not considered as realistic for the nation's ecological

survival. Although the current level of Korea's population and economic growth can be sustained by importing much of natural resources from other countries, the resulting vulnerabilities are alarming to its national security. In this situation, the nation's current rate of population growth, 1.6 percent, is not a desirable figure. The government has pursued comprehensive programmes for population reduction since the early 1960s. Consequently, the general trend of the nation's population growth has steadily been reduced over the last two decades. The ongoing efforts with regard to population reduction must be intensified. Resource shortages are only one problem derived from the problem of overpopulation. As the nation began to deepen its industrial structure to heavy and chemical industries, most labor-intensive manufacturing industries, the backbone of the national economy, have been in trouble causing unemployment to grow. The resulting unemployment problem is now a source of the nation's political stability.

Another source of growing foreign resource dependence is economic growth. Korea's economic growth is now positively correlated with rising resource consumption, especially energy. Effort to conserve energy consumption is required if the economy is to be kept viable and industry competitive. The government established legislative and regulatory measures to conserve energy consumption. But, Korea's dependence is still high, as compared with other

developed countries with respect to the weight of energy consumption in relation to the gross domestic product. This close relationship between economic growth and resource consumption must be reduced by technological advance and resource conservation. On the other hand, the government must increase the nation's domestic resource productions in possible areas. This policy is most attributed to its agricultural sector. It is true that the government has relatively ignored the development of its agricultural sector since the early 1960s. There exists a possibility to increase the nation's grain productions, such as wheat, corn, and soybean, which have shown severe dependence on foreign supplies. The development of agricultural sector is necessitated by its positive effects on the nation's unemployment and uneven population distribution problems.

Lastly, the government has to pay its policy attention to the nation's long sea-lane security. For oil imports, the transit of such chokepoints as the Hormuz and Malacca strait must be secured for Korea. The importance of the Hormuz has recently been diminished by the governmental policy of reducing the nation's imports of the Middle East oil. However, the importance of the Strait of Malacca to the nation's oil imports is still significant; about 90 percent of its oil passes through the strait. Moreover, much of Korea's trade volumes of commodities must pass the Strait of Malacca. Thus, the Korean government must enhance its diplomatic relationships with three surrounding

countries, Malaysia, Singapore, and Indonesia.

Another covert threat to the safety on the high seas is derived from the salient activities of the Soviet naval forces in the Indian Ocean. Facing the increased Soviet naval presence in the Indian and the Northwest Pacific ocean, there has been a disscussion between the United States and Japan about the possibility of Japan's military build-up for the defense of the Northwest Pacific area. For Korea, the concept of a broader Korean defense role including the defense of sea-lanes is not a desirable and feasible option, since the nation is still inferior to North Korea in military balance. It will be more reasonable for Korea to depend on the United States and Japan for the defense of the Pacific. At the same time, Korea is expected to rely on a mix of ships under its own flag and foreign carriers in its shipping policies. It is suggested that the government should encourage the use of foreign carriers for the imports of vital resources. This policy would alleviate the likelihood of directly interfering with resource flows to Korea.

The successful implementation of these suggested policies demands the satisfaction of other domestic and foreign policy prerequisites. Above all, Korea's foreign policy needs to be further diversified and neutralized to expand its economic activities throughout the world. The nation's current imports of natural resources include West developed and many developing countries. The pursuit of

diversification of its resource supplies and export markets will be easily attainable by extending its diplomatic map. As of 1984, Korea had diplomatic relations with some 120 nations through 80 embassies, 32 consulates and 3 missions, and its economic activities were spread over these countries. This figure is comparable with that of 1960 when the nation maintained only 10 embassies. Although the nation's current economic interactions largely concentrate on Western developed and Third World countries, Korea is even willing to open economic and diplomatic relations with Communist nations, including the Soviet Union and China. It is only because of the reluctance on the part of these nations that there has not been much progress.

A bilateral approach that Korea has employed for managing the Middle East can be regarded as realistic, since the pursuit of a multilateral approach has not been feasible and disarable, as explained in Chapter Four and Six. The expansion of Korea's diplomatic activities may produce new management problems. For example, Korea has tied its economic relationships with Iran, Libya, and Nicaragua where the United States meets hostile confrontation. This incongruence between the United States and Korea in terms of diplomatic relations may be a source of tension for their alliance cohesion. In this case, the strategy of delinkage between economic and political issues may be applicable for Korea to manage this problem. In any case, Korea's successful management of its extended diplomatic activities

will be a prerequisite for the nation's supply security.

At the same time, Korea should allocate more resources for the development of the economic and ecological sectors. The present trend is somewhat the reverse of this requirement. While defense expenditures have continued to represent over 30 percent of public expenditure since 1976, expenditures in social welfare, education, and economic development has remained constant or shown only an incremental increases. In particular, public expenditures on economic development have exhibited a declining trend since 1976. The expansion of the defense budget caused reductions in resource allocation in the economic sector. Korea's import dependence on food, energy, and non-renewable minerals is growing. This requires not only that goods and services be available for export, but also that they compete effectively with the offerings of foreign competitors. Korea is also expected to allocate more of its public expenditures to secure the nation's resource supplies for a future crisis situation. Thus, the Korean government should adjust its pattern of resource allocation in favor of its importance of economic security.

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