ENERGY RESOURCES AND ECONOMIC DEVELOPMENT IN REPUBLIC OF KOREA 1962 — 1985

Dissertation submitted to the Jawaharlal Nehru University
in partial fulfilment of the requirements for
the award of the Degree of
MASTER OF PHILOSOPHY

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1988

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This is to certify that the dissertation entitled 'Energy Resources and Economic Development in Republic of Korea (1962-85)', submitted by Miss Priti Dubey, in fulfilment of six credits out of total requirements of twenty-four-credits for the Degree of Master of Philosophy (M.Phil) of the University, is her original work according to the best of our knowledge and may be placed before the examiners for evaluation.

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P R E F A C E

The present study proposes to examine the correlation between the energy resources and economic development in the Republic of Korea.

The rapid pace of economic development in the Republic of Korea during the past two and a half decades has been commented upon by several scholars. However, adequate attention has not been given to the correlation between the structure of Korea's economic development and the pattern of energy consumption. The launching of the new strategy of economic development and the pattern of energy consumption. The launching of the new strategy of economic development based on planned economic growth and export-oriented industrialization in 1962, inevitably brought about significant changes in the policy, regarding the development of energy resources and the pattern of energy consumption. The study seeks to examine the factors that brought about changes in the energy policy and the pattern of energy consumption during 1962-1985.

An introductory chapter provides a very brief account of the strategy and outcome of Korea's economic development during the period 1962-85.

In the second chapter, the rationale and the results of various policy measures to develop energy resources, since 1962, have been discussed.

The third chapter analyses the impact of the two oil crisis (i.e. of 1973/74 and 1979/80) on the Korean economy in general and energy sector in particular.

The fourth and the final chapter summarizes the overall economic development and energy resources in the Republic of Korea.

Throughout the dissertation, term Korea has been used instead of Republic of Korea or South Korea. It would be necessary to mention that in the present study, Korea represents the territory lying to the south of 38th parallel.

I would like to extend my sincere thanks to Mr. R.R.Krishnan, Associate Professor, Centre for East Asian Studies, for his guidance and incisive comments.

I would also like to extend my sincere thanks to Centre Chairperson, Prof. Gargi Dutt and Dean, School of International Studies, Prof. P.A.N. Murthy, for their generous help and encouragement.

I am grateful to the library staff of the JNU, Indian Institute of Foreign Trade and Tata Energy Research Institute, for their efficient assistance and co-operation. I am really thankful to Mrs.Kunjamma Varghese, who has sincerely done all the typing work for me.

It is not possible to list all the friends to whom I owe much. They have provided congenial company and constant intellectual stimulation. To thank them, would be a pointless formality.

(PRITI DUBEY)

New Delhi
20th July 1988

C O N T E N T S

Chapter I

KOREAN ECONOMIC DEVELOPMENT 1962-1985: STRATEGY AND OUTCOME

The Republic of Korea made its debut in the comity of nation-states on 15 August, 1948. It emerged exactly three years after the end of three and a half decades of Japanese colonial role. It emerged against the backdrop of an artificial division into North and South of one of the most homogeneous nations in history. Its emergence marked the termination of the three year rule of the United States Military Government in Korea (USMGK), which was effective in the area south of the 38th parallel. Within a few weeks, after the emergence of Republic of Korea, another state the Democratic People's Republic of Korea (D.P.R.K.) was proclaimed on 9 September, 1948. Less than two years after the emergence of the two states, the peninsula was caught in a devastating War from 25 June 1950 to 27 July 1953. In April 1960, a student's revolution took place, which was successful in overthrowing the twelve year old regime of Syngman Rhee. The Chang Myon regime, that came to power following the students revolution, did not last long. It was overthrown by a military coup de'tat led by Major General Park Chung Hee on 16 May 1961.

In 1961, the Park regime embarked on a new strategy of planned economic growth and export-oriented industrialization. In order to gain a proper understanding of the rationale and significance of the new economic strategy, it would be useful to refer, albeit briefly, to the colonial economic legacy, dislocation of the economy as a result of the territorial division, the USAMGIK's intervention in the post-colonial economy and the policies followed by the Seoul Government during the years 1948-60.

When the colonial order collapsed in August 1945, Korea inherited a deformed and distorted economy. Whatever growth and structural change that took place during the colonial period, was essentially to supplement and sustain the industrialization of Japan. Korea was primarily used as a supply base of food, raw materials, semi finished products and labour force. It was also the conscious policy of the colonial state to suppress the emergence of a Korean bourgeois class and reserve most of the key posts in commerce and industry to the Japanese.[1]

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1. For details of the Japanese colonial period see, Bruce Cumings, The Origins of the Korean War Liberation and Emergence of Separate Regions 1945-48 (Princeton, 1981), pp.3-66; also see Gregory Handerson, Korea: The Politics of Vortex (Cambridge, 1968), pp.72-112.

The territorial division between the North and the South, worsened the already adverse conditions characterized by a dependent and uneven development. During the colonial rule, the Japanese had for a variety of reasons, invested in irrigation facilities mainly in the South and in mining and electricity in the North. Before 1945, rice and barley was mainly grown in the South which had 75 per cent of all paddy land, while the North lead in such crops as wheat and corn.[2] According to one estimate "in 1940 the North's estimated share of heavy industry production was 86 per cent of the total for Korea. By 1944, it was producing 92 per cent of the total electric power, 88 per cent of the fuel, 78 per cent of the mineral output, 98 per cent of the matellurgical output and 82 per cent of the chemical output".[3] Thus the division of Korea along the 38th parallel "totally destroyed the inter-industrial and geographical complementarity that was existent to some extent under the colonial rule".[4] As the 38th parallel solidified into a political,

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2. Byong Ho Park, "Natural Resources and Industrial Locations in South and North Korea", in International Conference on the Problem of Korea Unification (Report, Seoul: Asiatic Research Centre, Korea University, 1971), pp.476-78.

3. Shinn-Rinn Sup, et al, Area Handbook for North Korea (Washington, D.C., 1969), p.295.

4. Sangsop Park, "The Failure of Liberal Democracy in Korea, 1945-1979", in Kyong Dong Kim, ed., Dependency Issue in Korean Development (Seoul, 1987), p.333.

military, economic and administrative line, "what became the Republic of Korea was cut off from badly needed raw materials and electricity as well as market for its agricultural produce, with only eight industries on its side, it also had a rather lop-sided structure which was strained by the need to absorb the larger share of population".[5]

Although the American Military Government (AMG) was primarily concerned with a whole range of political issues that arose as a result of the sudden collapse of the Japanese colonial rule, it nonetheless, adopted a series of economic measures. For example, "it confiscated the Japanese investments. It also distributed government holdings formerly owned by the Japanese to almost a quarter of tenant population".[6] It has been argued that the land reform initiated by the AMG "prevented the resurgence of the traditionally powerful landlord class and subsequently contributed to the formation of industrial and bureaucratic elites in the political and economic arena."[7] The AMG also instituted a

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5. Jon Woronoff, Asia's "Miracle" Economies (Seoul, 1986), pp.93.

6. P.Kuznets, Economic Growth and Structure in the Republic of Korea (New Haven, 1977), pp.31.

7. Hyun Chin Lim, Dependent Development in Korea 1963-1979 (Seoul, 1985), pp.47.

"free-market economy" and between 1945 and 1948 "poured a total of $410 million of economic aid in current prices to rescue the urgent economic situation with much emphasis on relief supplies".[8] In short, while the AMG sought to restructure the inherited colonial economy, it wanted to ensure that Korea did not deviate from the capitalist path of development.

Relations between Korea and the United States, assumed greater significance and were further strengthened with the outbreak of Korean war. The United States' assistance to Korea took several forms, including massive economic and military aid. According to one estimate, between 1946 and 1952, Korea received $679 million of economic and military aid in current prices from the United States.[9] Korea continued to depend heavily on the U.S. aid to sustain its economy in the post-war year (i.e. post 1953), even as it pursued import substitution as the main strategy of industrialization. How substantial was the U.S. assistance to Korea could be seen in the fact that "during the

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8. David C.Cole, "Foreign Assistance and Korean Development", in Cole, Lim and Kuznets, The Korean Economy - Issues of Development (California, 1980), pp.9.

9. E.S.Mason, et al, The Economic and Social Modernization of the Republic of Korea (Cambridge, 1980), pp.182.

period 1952-1961, the US donated 95 per cent of total foreign aid which amounted to some 8 per cent of Korea's GNP, 77 per cent of capital formation and about 70 per cent of total imports".[10] Nearly 90 per cent of Korea's manufacturing industries relied on foreign grants during the post-war reconstruction period 1953-1960, almost a half of the total general government expenditures were financed by this foreign aid.[11]

The economy "had very little capacity to build its own production base, investments goods constituted only 14 per cent of all imports in the years from 1953 to 1960".[12] The growth rate of GNP in the period 1953-1962 was 4.1 per cent. The annual average growth rates of both per capita consumption and gross domestic capital formation were below 2 per cent and exports were inconsequential (less than $40 million a year) while substantial imports ($300-400 million a year), were financed mainly by American aid. The economy was still predominantly agricultural (over 60 per cent of

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10. Ibid., pp.185.

11. Jong-Jip Choi, "The Strong State and Weak Labour Relations in South Korea: Their Historical Determinants and Bureaucratic Structure", in Kyong Dong Kim, ed., n.4, pp.308.

12. Choong Yong Ahn, "Economic Development of South Korea, 1945-1985", Korea and World Affairs, Vol.10, No.1 (Seoul, Spring 1986), pp.27.

the labour force worked on farms, 40-50 per cent of output originated in agriculture), there was little change in structure and not much growth in output per worker.[13]

The military coup d'etat of 1961 marked a turning point in the political and economic history of Korea. Several factors seem to have contributed to the stability of Park regime. One of the most important factors was the Park government's ability to initiate and sustain a rapid pace of economic development, through the twin strategy of planned development and export oriented industrialization.

During the short lived second Republic (Chang Myan Government, 1960-61), a Five Year Development Plan was prepared by the Economic Development Council. Although initially, the Park government did not lend its approval to the Plan, it later accepted the plan with certain modifications. The Council was renamed as Economic Planning Board (EPB) in 1961. It took over the Bureau of the Budget from the Ministry of Finance, and the Bureau of statistics from the Ministry of Home Affairs.

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13. See Paul W.Kuznets, Economic Growth and Structure in the Republic of Korea (Yale University Press, 1977), pp.43-83.

Its head was given the rank of Deputy Prime Minister, and the post became one of the top three posts since the early 1960s. Before long the EPB began to weild enormous prestige and power because it assumed "responsibilities not only for development planning and coordination, but also of budgeting, coordination of foreign aid activities and attracting foreign investments".[14]

The first Five Year Plan was launched by EPB in 1962. Since then five plans have been completed without any interruption. Despite setting high growth targets in all the five plans, the targets were always outstripped by actual growth. The credit for the successful implementation of the Plan objectives, goes, to a certain extent, to the very nature of the planning process. Its nature lies "somewhere between 'indicative planning' and imperative planning". So far as planning is concerned with policy formulations it would be closer to "indicative" planning of private firms operating within the framework of a capitalist economy. But as far as planning is concerned with the techniques of policy implementation, it is closer

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14. Jong Jip Choi, n.11, pp.319.

to a "command" economy in the sense that the activities of a single firm form the object of state intervention with its powerful command and manipulation of incentives and sanctions. They key element that makes Korea's economic growth extraordinary is just this effective capability of putting plans into effect".[15] In other words, the effective implementation of the plans, or for that matter, of export promotion was largely depended on the state's capability to ensure private compliance. For this "the state commands the most potent instruments, among which are control of bank credit and access to foreign borrowers... on the level of Plan implementation the distribution between the State and Private corporations, between public and private domains, is virtually blurred in these particular state-business relations".[16]

Two more important aspects regarding the plans need to be mentioned. While the First (1962-66), Second (1967-71), Thrid (1972-76) and the Fourth Plan (1977-81), "set specific, numerical targets for the development of industries and infrastructure and the government backed up the target with its financial and organizational capabilities, the later

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15. Ibid., pp.316. Also see Amiya Bagchi, Public Intervention and Industrial Restructuring in China, India and Republic of Korea (New Delhi, 1987).

16. Ibid., pp.317.

plans tended to be more indicative, in setting for the economic orientation of the government and the direction of policies during the plan period."[17] Beginning with the Fifth Plan (1982-86), there was a considerable emphasis on social policies, such as health care, education and housing programmes. In fact, since 1982, the plans are called "Economic and Social Development Plan". The plans listed sectors, which were expected to play a crucial role in the economy. A few sectors like energy, petrochemicals, steel, heavy machinery, electronics, power generators, telecommunications and shipbuilding were designated as 'strategic' and the government gave all out support.

Within the overall plans, medium term plans were carefully designed and "they were converted into annual plans, first in the form of the overall resources budget and later as an economic management plan. This created a "rolling plan" which was mere amendable to revisions and rectifications imposed by changing circumstances..."[18] A critical component of the new strategy of economic development was the promulgation and vigorous implementation of a series of laws and executive fiats, regulating

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17. A Handbook of Korea (Seoul, 1987), pp.360.

18. Jon Woronoff, n.5, pp.98.

most areas of economic life, including foreign capital, foreign investments, technology induction, interest rates, bank credits, allocation of prices on a whole range of commodities, "reasonable" wage rates of the workers, law concerning special measures for safeguarding national security (LSMSNS), imports, exports and so on.[19]

The export-oriented industrialization (EOL) formed the core of the new economic strategy. Within the EOI framework, several policy measures were adopted from time to time, to achieve the desired rate of growth. Production of manufactured goods for exports, was made the spearhead of Korean development strategy. In fact, export promotion became an absolute priority. As a well known export on Korean economy puts it "the growth of aggregate output has been led by industrial sector, the industrial sector by manufacturing and manufacturing by export".[20]

The Korean government has adopted several measures, from time to time, to promote exports. Some of the most

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19. Kyon Dong Kim, n.4, pp.317. Also see Amiya Bagchi, n.15, pp.37.

20. P.Kuznets, "Korea's Emerging Industrial Structure," ILCORK Working Paper, no.6, Social Science Research Institute, University of Hawaii, cited in Kyong-Dong Kim, Rethinking Development: Theories and Experiences (Seoul, 1985), pp.196.

important measures have included downward revolution of currency to cheapen exports, protection for native industries, tax holidays, exemptions and reduction across the board for export firms, wastage allowance subsidies, "attractive" terms to induce foreign capital, technology and investments and creation of Export Processing Zones.[21] The rationale for Export-Oriented Industrialization was simple. Given meagre raw materials, scarce capital and small domestic market, it was thought, that the only path of development within the paradigms of capitalism open to Korea was to induce foreign capital investment and technology on "attractive terms". Korea wanted to take advantage of the abundant, literate, disciplined and motivated labour at low wages to produce manufactured goods for international market.

Since the mid-1960s, the United States and Japan came to occupy prominent position in the Korean Economy. Both emerged as major sources of foreign capital (including both public and commercial loans), foreign direct investment

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21. R.R.Krishnan, "South Korean Export Oriented Regime Context and Characteristics," Social Scientist (Vol.13, Nos.7-8), pp.91. Also see Parvez Hasan, Korea: Problems and Issues in a Rapidly Growing Economy (World Bank Economic Report), Larry E.Westphal, et al, Exports of Capital Goods and Related Services from the Republic of Korea (World Bank Staff Working Paper No. 629, 1984).

sophisticated technology and leading trading partners.[22] The success of the export-led industrialization policy was recorded at a time when the world capitalist economy was on an upswing cycle and when "trade liberalisation and expansion were major aspirations in world economic policy discussions, when Kennedy round of the 1960s was being negotiated and the Generalized System of Preference (GSP), in the UNCTAD was gaining acceptance. International trade was also growing at a rapid rate and there was high demand for the inexpensive labour intensive goods".[23] It was not a fortuitous conjunction that countries like Korea embarked on the strategy of Export-led Industrialization at "the time when the global division of labour started changing as a consequence of new technology. The new para meters of comparative advantage emerged suggesting relocation of the labour intensive process in the labour rich production areas. Hence, industries like textiles, leather, electric came to the soil of the raw material exporter of third world economies. Since these manufacturing capacities were created in

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22. For data on investment see Industrial Development Restructuring Series, Republic of Korea (UNIDO, Table 23), pp.36-37; and for loans see Korea Annual, 1986, pp.150.

23. G.C. Pant, "Political Economy of 'Korean Miracle'," Social Scientist (Vol.13, No.5, May 1985), pp.22.

view of the external market, hence, access of that market became the key element for capacity utilisation".[24] Finally, when one examines the capital flow from the advanced industrialised countries to the developing countries since the later half of the 1960s, it would be seen that the major borrowers were the export-oriented economies.[25] In short a combination of indigenous and exogenous factors contributed to the success of the new strategy of economic development pursued by the Seoul Government since the early 1960s.

In the short span of twenty five years since the launching of the new strategy of economic development based on five year plans and export-oriented industrialization the Korean economy has witnessed a remarkable structural transformation, dynamic development of the productive forces and tangible improvement in the standard of living of the people. The GNP rose from $2.3 billion to $87.6 billion is current prices, between 1962 and 1985, through an average increase of more than 8.5 per cent

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24. Ibid.

25. Jeff Friedman, "Third World Industrialization: International Finance and State Capitalism in Mexico, Brazil, Algeria and South Korea," International Organization, 35, 3, Summer 1981.

annually in real terms. Meanwhile, per capita GNP rose from $87 to $2032 in current prices.[26] As a result of which, significant improvement took place in the standard of living of the people.

The structure of production and of employment changed significantly. The proportion of the primary sector in the total economic output fell from 38.6 per cent in 1962 to 13.8 per cent in 1985, but the share of the manufacturing sector rose from 16.3 per cent to 20.6 per cent and that of social overhead capital from 47.1 per cent to 56.6 per cent over the same period. The share of manufacturing sector in total employment increased from 10 per cent to 25 per cent in the 1962-85 period.[27] In fact, Korea became one of the few countries with a share of manufacturing in GDP of about 30 per cent.[28] The average long-term growth rates of GDP (10 per cent in 1965-73, 7.3 per cent in 1973-84) and of GNP per capita (6.6 per cent in 1965-84) indicate that Korea "has been able to cope with the major challenges confronting economies heavily reliant on

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26. See Handbook of Korea,1987. Also see, Korea Annual 1986.

27. Major Statistics of Korea, 1985.

28. Industrial Development Review Series, n.22 (Table 2), pp.2.

manufactured exports for the world market such as the persistent need to bring about required structural changes in utilizing particular comparative advantage vis-a-vis the international economy".[29] In 1984, five sub-sectors, i.e. Textiles, Footwear, Machinery, Iron and Steel and Transport equipments accounted for 39.4 per cent of manufacturing value added (MVA), 44.5 per cent of employment in manufacturing and 74.1 per cent of manufacturing exports.[30] The overall improvement in job opportunities is also note-worthy. The employed population increased by an average of 6.1 per cent annually from 7.7 million in 1963 to 15.6 million in 1985.[31]

The most significant and dramatic growth took place in sectors like textiles/apparel, energy, petro-chemicals, electronics, machine tools, steel, ship building, cement and automobiles, which were designated as 'strategic' sectors, during the course of five Five Year Plans. In fact the growth of total industrial sector was such that it contributed for a significant portion of GNP since 1962.

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29. Ibid.

30. Ibid., pp.12.

31. Korea Herald, 31 March 1987.

The share of industrial sector in GNP, has registered a sudden spurt in 1970, when development and production of various strategic industries like automobiles, electronics etc. were given prime importance. This fact is clearly evident in the Table 1.

Table 1

GNP BY INDUSTRIAL SECTOR
(in billion Won at 1980 constant prices)

Year	Total
1962	3,071.4
1969	5,911.39
1970	17,013.0
1975	25,815.70
1980	36,672.30
1985	52,705.40

Source: The Bank of Korea, as quoted in Yearbook of Energy Statistics, 1987, pp.308-9.

Let us examine the growth of the three sectors, Iron and Steel, electronic and shipbuilding, which have shown striking growth rates. Before 1973, the steel production was around one million tonnes. Since the completion of the first integrated steel mill in Pohang (POSCO) Korean steel

industry began to grow rapidly. In 1985, Korea produced 13.8 MT of steel. The Pohang steel mill alone accounted for little over 9 million tonnes, and it is rated as the largest, and one of the most efficient steel mills in the world. Thus from a totally insignificant position Korean steel industry had grown rapidly to become the world's 14th largest producer of crude steel in 1985.[32]

The Korean electronics industry emerged towards the end of 1950s. Its main products then were radio sets and other related products. A major breakthrough came in the 1960s when components for electronic assemblers, transistors, diodes, colour and black and white televisions and integrated circuit dominated production. The pattern of growth and product differentiation were maintained in the 1970s and the first half of 1980. By 1980, Korea ranked among the world's top ten producers of electronic goods. From a total production of $1,000 million in 1976, the electronics industry registered an impressive total of $7,285 million in 1985.[33] Korea is one of the four nations in the world that manufactures complete Video Cassete

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32. Handbook of Korea, n.17, pp.377-78.

33. Ibid., pp.382.

Recorder (VCR) and Microwave Ovens. What is most significant to note is that the ability of Korean technologists to develop the crucial 'missing' technology through their own efforts in the manufacture of TVs, VCRs and microwave ovens.[34] The most striking development was witnessed in the shipbuilding industry during the 1970s and the first half of 1980s. By the end of 1985, Korea became the world's second largest shipbuilding country. In 1963 Korea built 1,63,000 GT ships, which grew to 2,79,000 GT ships in 1985. The exports of ships which were valued at only $2100 million in 1962 rose to $5030 in the 1985.[35]

The ratio of foreign trade to GNP increased from 20.9 per cent in 1962 to 73.9 per cent in 1985. In other words, the trade volumes expanded more than 128 times during the period, with its export-import volume totalling $61.4 billion in 1985. This meant that Korea's share in world trade increased to 1.66 per cent in 1985 from 0.04 per cent in 1962.[36] During the period 1962-85, the Korean export growth rate averaged 31.6 per cent annually while

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34. Kyong Dong Kim, n.4.

35. A Handbook of Korea, 1987, pp.384.

36. Korea Herald, 3 March, 1987.

its import growth rate averaged 20.6 per cent. Exports had registered an impressive growth rate in the period 1962-85, and its ratio to GNP rose from 4 per cent in 1960s to 30 per cent by the early 1980s. This was possible because exports kept increasing much more rapidly than overall production. It was the manufactured sector that accounted for the biggest share of Korean exports. Its share of the total exports rose from 20 per cent in 1962 to over 90 per cent in 1985.[37]

The composition of exports have changed significantly in this period. In the 1960s, Korea's export items were dominated by primary industrial products as minerals and agricultural products. A major shift took place in the 1970s, when Korea started exporting, light industrial goods which was finally replaced by heavy and chemical industrial goods in the subsequent years. As a result of the new strategy of Economic Development, there was a rapid industrialization and marked improvement in the standard of living of the people.

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37. See Major Statistics of Korea, 1986. Also see, Korea Annual, 1986, and A Handbook of Korea, 1987.

For example, in later years of industrialization (late 1970s), the number of passenger cars increased more in comparison to the number of commercial vehicles (see Table 2).

Table 2

MOTOR VEHICLE PRODUCTION

Year	Total	Passenger car	Commercial vehicle
1970	28,819	13,668	15,151
1975	37,179	17,484	19,696
1980	123,135	55,926	67,206
1982	162,590	93,451	69,139
1985	378,162	262,775	115,387

Source: Korea Automobile Industrial Cooperation Association.

The year 1982 clearly shows the reversal of the trend. Since 1982 the number of passenger cars was more than the total number of commercial vehicles.

This created an enormous demand for energy. In the following chapter, we shall see the development of the energy resources in Korea during the years 1962-1985.

Chapter II

DEVELOPMENT OF ENERGY RESOURCES: AN OVERVIEW

Energy is the key to raise labour productivity in all economic activities. It is also a pre-requisite to transform the structure of the economy. To sustain the economic development of a country, a regular and reliable source of energy is essential. The energy resources of a country are not precisely given. They can be assessed at a particular time, among other things, in relation to the existing state of knowledge and techniques and level of economic development. The existing and expected sources of energy are an important determinant in formulating the economic policy of a country. As a matter of fact, Korea is poorly endowed with energy resources. There is no known reserves of oil. The only fossil fuel available in substantial quantity is anthracite coal. While the estimates regarding anthracite coal reserves have varied, the recoverable reserves have generally been estimated around 640 million tonnes. Bituminous coal, which is one of the most indispensable fuels for industries like cement and steel is virtually non-existent.

The biggest coal field area is the Samchuk area in Kangwando, in which 32.1 per cent of the total reserves and

44.4 per cent of the recoverable resources are located. In addition the Jyongsan and Chungnam areas which are estimated to contain a little over 27 per cent and 13 per cent respectively of the total reserves can also be considered as major coal fields. However, it is the Samchuk area which has accounted for over two-thirds of Korea's total coal output. All coal mines are underground mines with an average depth of 340 metres. The narrow and irregular shape of the coal mines has not only contributed to the sharp escalation of production cost but also to the large number of accidents.[1]

The impact of the division of the Peninsula was felt most on South Korea's energy resources, especially hydel power generation, as most of the hydel power generating units were located in the North. As a result of the division, hydro-electric power could be generated in South Korea from only four rivers i.e., Han, Sumjun, Nakdong and Kum. The potential hydro-electric power in South Korea from the four rivers was estimated at less than 3000 MW, of which 1803 MW (about 61 per cent) was to

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1. Yearbook of Energy Statistics (Ministry of Energy and Resources, KEEI, Seoul, 1987), Table 12, pp.142-43.

be from the Han river, 563 MW from the Sumjun, 383 MW from the Nakdong and 217 MW from the Kum.[2] It is against this background of unenviable and deficient energy resources, that Korea sought to bring about a structural change in the economy and improve the standard of living of the people through the launching of the new strategy of economic development in 1961.

The successful implementation of the industrialization policy and the substantial improvement in the standard of living of the people influenced the energy consumption pattern immensely. The period 1962-86, registered more than seven fold increase in the total energy consumption, from 9.2 MTOE in 1962 to 67 MTOE in 1986. As GNP grew with a rate of 9.9 per cent in 1962-70 period, the rate of growth of energy consumption was 8.5 per cent. This pattern was maintained in later years also, with the exception of the years 1972, 1973 and 1974. Growth rate, that declined to 3.8 per cent in 1972, suddenly shot up to 14.8 per cent in 1973, and again it sharply declined to 1.5 per cent in 1974. However, the growth is steady since 1975 and is maintained around 6.4 per cent per annum, as is evident from Table 1.

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2. For details see, Park Byong Ho, "Natural Resources and Industrial Locations in South and North Korea," in International Conference of the Problem of Korean Unification: Report (Asiatic Research Centre, Korea University, Seoul), pp.971, 476-513. And also see, A Handbook of Korea (Seoul, 1979), pp.575-77.

Table 1

SOUTH KOREAN GNP AND TOTAL ENERGY CONSUMPTION 1962-86

Year	Growth rate of GNP (%)	Total energy consumption by primary energy Type (Unit: 1000 tonnes of oil equivalent)						Total	Growth rate of total energy consumption (%)
		Coal	Petroleum	Hydro-electric	Wood	Nuclear	Gas		
1962	3.1	3427	888	158	4825	-	-	9298	6.2
1963	8.8	4058	992	164	4643	-	-	9857	6.0
1964	8.6	4435	984	169	4674	-	-	10262	4.1
1965	6.1	4829	1300	160	4638	-	-	10927	6.5
1966	12.4	5468	1928	222	4159	-	-	11777	7.8
1967	7.8	5552	3226	215	3963	-	-	12956	10.0
1968	12.6	4901	4639	209	4215	-	-	13964	7.8
1969	15.0	5141	6297	322	3928	-	-	15688	12.4
1971	9.2	5796	9781	297	3703	-	-	19577	8.1
1972	7.0	5688	10477	308	3599	-	-	20072	3.8
1973	16.7	7147	12290	289	3312	-	-	23038	14.8
1974	8.7	7379	12389	430	3179	-	-	23377	1.5
1975	8.3	7779	13675	380	3085	-	-	24919	6.6
1981	5.8*	15294	28129	559	2442	774	564	47762	
1986	7.6*	23344	33431	726	1051	6561	3733	67069	6.2*

Source: As quoted in Young-Sun Ha, Nuclear Proliferation, World Order and Korea (Seoul, 1983), pp.98-99.

Notes: *Average growth rates per year during the period of 1977-81 and 1982-86.
(-) means nil.

The per capita consumption of the two major energy resources, coal and oil during the year 1966-1986, shows some interesting features. With the increase in GNP, the per capita consumption of anthracite coal rose from 391 kg in 1971 to 626 kg in 1986 and that of refined oil from 393 barrels in 1971 to 747 barrels in 1986.[3] The share of coal in total energy consumption rose gradually from 16.5 per cent in 1955 to 37 per cent in 1962, and peaked at the level of 46.4 per cent in 1966. The later years registered a decline in the proportion of coal, so as to reach at the level of 31.5 per cent of total energy consumption in 1986. Hydro-electric is the one source of energy, that has maintained its share between one and two per cent of total energy consumption, throughout the period 1962-86. The most significant change that took place, was the evaluation of nuclear and natural gas as potential source of energy. Natural gas rose from 1 per cent to 5.6 per cent over the same period. Moreover, Korea is highly optimistic about nuclear energy and natural gas as the future source of energy. "Non-existent up to 1977, it was contributing 7.4 per cent of total consumption of primary energy in 1985 and

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3. EPB, Major Statistics of Korea 1986 (Seoul, 1987), Table 5-12, pp.116.

20 per cent of total generation of electricity in 1984. Korea had four nuclear power units in operation at the end of 1985 with a total capacity of 2720 MW (higher than for instance, the GDR, India, Italy and Netherlands) constituting 1 per cent of the world total.[4]

The deficiency of indigenous energy resources could be seen in the increasing reliance ratio of the Korea on imported fuels. The Reliance ratio, that was 58.8 per cent in 1975, rose to 73.7 per cent in 1980 and finally to 76.4 per cent in 1985.[5] As the process of industrialization gained momentum, energy imports as a percentage of merchandised exports also increased, and was 28 per cent in 1983.[6]

Coal and firewood were the prime energy sources until the first half of 1960s. The first five year plan, recorded the coal output increase "at an annual average growth rate of 14.6 per cent, and the coal output in 1967

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4. UNIDO, The Republic of Korea (Regional and Country Studies Branch, Vienna, 1987), pp.72; also see Yearbook of Energy Statistics (1987), pp.298-99.

5. EPB, Major Statistics of Korea 1986, pp.120.

6. Report, World Bank Development 1985, Table 2.

reached 12,436 thousand tonnes, a record output almost doubling that of 1962.[7]

The 1967-70 period has recorded a decline in the coal production. This downward trend in the ratio of coal supply to total energy sources have been attributed to the governments policies of encouraging oil consumption. Another factor responsible for declining coal consumption was sluggish production of coal due to lower marginal productivity.

Coal mining was once again activated in the early 1970s, especially after the first oil crisis of 1973. A sudden spurt in the loans for coal development, could be seen in the year 1974, when the amount rose from 1,351 million Won in 1973 to 3,127 million Won in 1974. As a result of which, coal production stood at 16,427,000 tonnes in 1976. This momentum was sustained in the Fourth and Fifth Plans so that the coal production stood at 22,543,000 tonnes in 1985.[8] Contrary to the utilities of bituminous

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7. Industry in Korea (Seoul, 1976), pp.35.

8. Major Statistics of Korea, 1986, pp.123; also see Yearbook of Energy Statistics, pp.140-41 and 134-35.

coal, anthracite coal is very much in demand for residential heating. "The residential anthracite consumption is currently 18 million tonnes per year, occupying close to 64 per cent of total residential heating market".[9]

The prices of coal are determined by domestic factors and are fully controlled by government. From mines to final delivery, the government has set prices at each stage of the supply channel. In addition to price control, the government provides huge subsidy to the coal industry. "The production cost of the state run coal company is used as a basis for setting price ceilings for the entire domestic output. The state company produces about 25 per cent of the total domestic output, and its production takes place mostly in better coal fields, i.e. large reserves, shallow depth etc.[10] However the price mechanism of fixing the ceiling of coal prices, on the basis of cost of production in the state run enterprises, seems to have been faulty. The state run company was provided protection by the government and the exact marginal cost of production is not revealed. It is,

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9. Hoesung Lee, "Energy Taxes, Subsidies and Prices," in Dalchoong Kim (ed.), Energy Policies in Korea and Japan (Seoul, 1986), pp.87.

10. Ibid., pp.90.

therefore, difficult to calculate the extent of under pricing in the prices of coal.

What is significant to note, is that, Korea has had to import bituminous coal primarily for its cement and iron and steel industries. The demand for bituminous coal showed an increase after the setting up of the first integrated steel mill at Pohang in 1973, as can be seen from the following table (Table 2).

Table 2

BITUMINOUS COAL IMPORTS
(Unit: 1000 M/T)

Years	Imports
1963	134
1968	104
1972	33
1973	649
1977	2100
1981	7245
1985	17131

Source: Yearbook of Energy Statistics, Table 17, 1987, pp.152.

To meet the growing demand for bituminous coal, Korea decided to engage in mining bituminous coal in overseas coal

mines. An overseas Resource Development Promoting Corporation established the overseas Mineral Resources Developing Fund to provide necessary facilities. Initiative was taken in this direction and Korea gained quite a bit of success in the project. "Pohang Steel Company (POSCO), a government owned corporation, began investing in Tanoma Coal Mines in America in 1980 and started producing coal in September 1982. In addition to this, POSCO is participating in the development of bituminous coal at Mt.Thorley Mines in Australia and at Greenhills Mines in Canada with 20 per cent shares in both projects".[11] By 1983, Korea had been able to develop 1.27 MT of bituminous coal directly in the overseas coal mines. A broad outline of Korea's overseas bituminous coal development is shown in Table 3.

Among the five overseas coal development projects launched in 1984, two are at the development stage and three at the exploration stage.

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11. Euisoon Shin, "Energy Supply Policies in Korea and Japan", in Dalchoong Kim (ed.), n.9, pp.18; also see Yearbook of Energy Statistics (1987), pp.136-37.

Table 3

OVERSEAS BITUMINOUS COAL DEVELOPMENT PROJECT (1984)

Country and mines	Company	Main Partner	Korean share	Estimated Investment (million $)
Tanoma (USA)	POSCO	-	100	68.5
Mt.Thorley (Australia)	POSCO	R.W.Miller	20	49.0
Greenhills (Canada)	POSCO	Wester Mining Ltd.	20	60.0
Drayton (Australia)	Hyundai Daesung	C.S.R.	5	15.5
Usibelli (USA)	Sunil Shipping Co.	U.C.M.	-	1.0

Source: Ministry of Energy and Resources, Long Term Energy Outlook and Strategy for the 2000s, 1985.

Not being a producer of oil, Korea had to rely totally on its imports. The import of oil showed a sharp rise after Korea began to lay special emphasis on the development of chemical and other heavy industries. Total imports of crude oil, that was 11,170 thousand barrel in 1965 rose to 198,313 thousand barrel in 1985. Thus, there

was more than seventeen fold increase in the imports of oil between 1965 and 1985. Most of the crude oil was imported from the Middle East countries. However, a diversification of market took place in later years, especially after the second oil crisis. The Table 4 sums up the oil imports of Korea by country of origin.

Table 4

CRUDE OIL IMPORTS BY COUNTRY OF ORIGIN
(UNIT: 1000 barrel)

Country	1965	1970	1975	1980	1985
TOTAL	11,170	69,190	117,795	182,861	198,313
Saudi Arabia	-	21,995	51,861	111,855	13,746
Kuwait	7,137	24,998	53,637	45,401	17,520
Oman	-	-	-	-	23,125
Malaysia	-	-	-	400	19,745
Indonesia	-	-	-	116	20,183
Brunei	-	-	-	-	8,068
Eucador	-	-	-	662	21,983
Others	4,033	22,197	12,297	24,427	73,943

Source: Yearbook of Energy Statistics, 1987, Table 9, pp.108-9.

Compare to other countries, Kuwait remained a consistent supplier of crude oil to Korea since 1965. Next to Kuwait, Saudi Arabia emerged as another major supplier.

Beginning with an order of 12,545 thousand barrel in 1969, imports from Saudi Arabia rose to 111,855 thousand barrel in 1980. Imports from Kuwait increased in the initial years to reach at the maximum level of 53,637,000 barrel in 1975, but later declined and reached to the level of 17,520,000 barrel in 1985.[12]

In 1964, an oil refinery with the capacity of processing 35,000 barrels per day was set up at Ulsan. It was a joint venture between the Korean government and the Gulf Oil Company of the U.S. As the petroleum demand skyrocketed, the government continued to expand oil refinery facilities. "In spite of the lack of domestic crude deposits, the country embarked upon an accelerated build up of rational petroleum and petro-chemical industries, mostly in co-operation with foreign companies".[13] The Kukdong Oil Co. refinery came on stream from 1966. The other three joint venture refineries with foreign oil companies are Honam Oil Refinery Company Ltd. (in 1969); Kyung-In Energy Company Ltd. (in 1971); and Ssangyong Oil refinery Co.Ltd. (in 1980). "Five oil refineries are now in operation and their total capacity is 790,000 BPSD as of

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12. See Table 4 in this chapter.

13. UNIDO, The Republic of Korea (1987), pp.70.

the end of 1985, more than 22.5 times the 35,000 BPSD level in 1964... The refineries were able to meet the abrupt increase in demand for naptha after Yochan Petro-chemical Complex came on stream in 1979".[14] Thus, a significant change took place in the supply pattern of petroleum products.

The ratio of petro-chemicals industry to GNP in terms of value added was 0.1 per cent in 1970. As the government expanded investments in heavy and chemical industries in the 1970s, the petrochemical industry has experienced a big expansion. The ratio, that was 0.6 per cent in 1975, rose to 1.3 per cent in 1985. In terms of output, the ratio of petro-chemical industry to manufacturing sector was 0.6 per cent in 1970, 3.5 per cent in 1980 and 2.9 per cent in 1985.[15]

"Korea has launched her petro-chemicals industry in the 1970s by accepting transfer of technologies from advanced countries... The transfers from Japan are almost 45 per cent of the total, while the transfers from the United States are 30 per cent".[16] Commodity-wise, the maximum share of technology transfer took place in synthetic resin. Petro-chemicals

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14. A Handbook of Korea (Seoul, 1987), pp.40.

15. Table 4-5, Forum on Minerals and Energy (Pacific Economic Cooperation Conference, Seoul, 29-30 October 1987), Section 7, Session 4.

16. Ibid., pp.16.

industry is closely related with other industries, as a supplier of inputs.

Most of the export industries use its products as an input. Demand for petro-chemical products mainly increased in textile, tyre, footwear and plastic manufacturer in initial years. Later electronics and automobile industries emerged as an important consumer of petro-chemical products. The total production of petroleum products stood at 68,303 thousand barrel in 1970. It rose to 176,226 thousand barrel in 1980 and five years later in 1985 it stood at 197-559 thousand barrels.[17]

The price of petro-chemical products came to be controlled by government since the 1970s. In 1980, the government tried to lift all price controls but in vain. A policy of dual pricing is being followed. The prices of domestic consumption are determined by cost of production and profit margin, whereas, prices of petro-chemical products, to be used for production of export commodities are controlled to maintain international competitiveness of products.

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17. Table-2, Energy Statistics Yearbook (Seoul, 1987), pp.80-81.

In order to reduce its dependency on imported oil, Korea went for on-shore and off-shore drilling in 1979. Till now these efforts have failed to produce commercially viable source of oil. Even in the case of importing oil, a diversification in the market was sought. "As a result the share imported from the Middle-East countries decreased to 74 per cent in 1983. The share of the three Middle-East countries (i.e. Kuwait, Iran and Saudi Arabia) dropped to 57.5 per cent and the number of countries from where crude oil was imported increased to eleven in 1983".[18] The world wide second oil crisis in 1979, was working behind the diversification in imports markets. Countries like Malaysia, Indonesia and Brunei emerged as oil supplier to Korea in 1980. And a sharp increase was visible in the quantity of oil imported from these countries vis-a-vis Saudi Arabia and Kuwait from where the quantity imported declined.[19] This was done in order to maintain the stock supply of imported oil. Apart from this, Korea is involved in overseas oil development activity to ensure a steady supply of crude oil.

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18. Euisoon Shin, n.11, pp.3-4.

19. See Table 4 in this chapter.

The total lack of crude oil deposits and increasing consumption of oil, has inflated Korean imports bill. The amount of foreign exchange paid for imported crude oil, that was $29 million in 1966, rose to $5499 million in 1985. Following table give the clear picture of the Korean bill paid for the import of crude oil.

Year	Payment in million dollar
1966	29
1973	305
1974	1104
1979	3330
1980	5654
1985	5499

Source: Major Statistics of Korea, 1986, pp.128.

The setting up of petro-chemical industries was one of the crucial factors, responsible for soaring import bills for crude oil. However, oil was available in the international market at reasonable prices. Compared to the purchase of oil, the cost of mining coal was more. This may explain why Korean energy policy favoured the import of oil in the initial years of heavy industrialization.

Korea's rapid economic development and industrialization increased "the demand for electric power by an annual rate of 22.3 per cent during the 1962-71 period (First and Second Plan), 16.5 per cent for 1972-76 period (Third Plan), 12.3 per cent for 1977-81 period (Fourth Plan) and 9.4 per cent for the 1982-85 period, almost double the rate of developed countries.[20] In order to meet the rapidly increasing demand, the government designed Electric Power Development Plans, within the framework of Economic Development Plans. The successful implementation of the Power Development Plans resulted in the enhanced production of electricity power supply. As a result of which in the "First and Second Five-Year Development Plans the power generating facilities, were increased from 434 million watts in 1962 to 2,628 million watts in 1972, and to 4,720 million watts at the end of 1975".[21] The overall growth rate of 20.2 per cent per annum was registered during the period 1962-1975. The capacity for power generation increased to 9,400 MW in 1980 and 17,570 MW in 1986.[22] To expand the

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20. A Handbook of Korea, 1987, pp.400.

21. Industry in Korea, n.7,

22. See Young-Sun Ha, Nuclear Proliferation, World Order and Korea (Seoul, 1983), pp.101.

capacity, private electricity companies were allowed to participate during the second five year plan. The government owned Korea Electric Power Corporation (KEPCO), took over the Tonghae and Honam electric companies in the Third Five Year Plan (1972-76). In addition to this Kyong In Energy Co., continued to operate its oil fired power plants providing electricity to KEPCO.[23]

To provide for increasing energy demands "four coal fired plants, two nuclear, two LNG Plants and one pumped storage station were commissioned from 1982 to 1985 to meet the nation's increasing energy demand and oil substitution."[24]

At the end of 1985, there were 38 thermal power plants and 26 hydro-power stations in Korea. With the recent completion of Kori No.5, four nuclear units and two pumped storage plants are in operation. "The electrification of fishing and farming villages is one of KEPCOs major achievements. In two decades, since the electrification rati in rural areas stood at a meagre 12 per cent in 1965, every household, except for extremely remote areas, like small

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23. A Handbook of Korea.

24. A Handbook of Korea, 1987, p.396.

islands, was well within range of the national electricity system as of the end of 1984."[25] In addition nuclear power also came to occupy a significant role in electricity generation as is evident from the Table No.5.

Table 5

ELECTRIC POWER GENERATED AND PURCHASED
(Unit: Million KWH)

Year	Hydro	Thermal	Nuclear	Power purchased	Total
1962	702	1276	-	-	1978
1972	1368	8518	-	9886	11839
1978	1281	25373	2324	2532	31516
1983	2071	35548	8965	2320	48850
1985	2159	37276	16745	1827	58007

Source: KEPCO.

Korea is one of the few developing countries, that has given enormous importance to the successful development of nuclear energy programme. Korean interest in the development of the programme began in the mid-1950s. The

25. Korea Herald (Energy supplement), 19 March 1988.

agreement for the co-operation between Korea and the United States, concerning the civil uses of atomic energy were concluded in February 1956. It marked the beginning of Korea's nuclear energy programme. In the very next year Korea joined the IAEA. The year 1959, marked the establishment of Korea Atomic Energy Authority, which worked on the country's first nuclear reactor. It was an experimental model built by a leading manufacturer of U.S., the Westinghouse (WEICO). The reactor's rated power output was 250 KW and it was brought on line in March 1962. However, Korea's first commercial reactor was a pressurised water reactor supplied by Westinghouse under a contract concluded in 1968. Work on the reactor began at Kori in March 1971. "After contracting financial arrangements with the EXIM Bank of the U.S., WEICO, Bank of America, Lazards Brothers Bank (UK) and English Electric and George Whimpey Group (UK) for the construction of the plant, KECO, on June 23, 1970, signed the construction contract for the project with WEICO".[26]

Even as construction began on Kori-1, KECO prepared the blue print plan for Kori-2 in July 1973 and selected WEICO as the prime contractor in a turnkey type contract for

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26. Young Sun Ha, n.23, pp.89.

the plant. However, the negotiation with the EXIM bank of the U.S. ran into a rough weather. The US Senate Banking Committee's sub-committee on international finance, sought to block the EXIM credit - a $79 Million loan and $157 million on loan guarantee until Korea ratified the Nuclear Proliferation Treaty (NPT).[27] Korea signed the treaty on 20 March 1975, leading to the approval of EXIM Bank loans and loan guarantees. Korea complied with IAEA (International Atomic Energy Association) on safeguard agreements. In 1976, Korea entered into a contract with AECL, for a heavy water reactor, CANDU. Work on CANDU (600 unit at Wolsung) started in 1977 and Wolsung I went into commercial operation in 1983. In the meanwhile, the construction of Kori-2 with the help of Westinghouse got underway in 1977. In January 1975, KECO and AECL signed the construction contract for the project, that was to be financed by a group of Canadian and British banks, who agreed to lend $380 million for the project.[28] It was finalised after an agreement, signed between the two governments, on safeguards in the transfer of nuclear technology. In March 1978, the Korean government decided

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27. Ibid., pp.92.

28. See Wall Street Journal, 29 May 1975, as quoted in Young-Sun Ha, n.23, pp.94.

to import two more units of Reactor (No.5 and 6), from the Westinghouse. The condition for this project was that the U.S. EXIM bank will provide loans for these projects. Negotiations for the Unit No.7 and 8 started in 1979, and Westinghouse was finally awarded the suppliers contract.

As of the end of 1985, four nuclear units were in operation. The total capacity was 2,866,000 KW representing 17.8 per cent of nation's total power generating facilities. Nuclear power production of 16,745 gwh, occupied 28.9 per cent of total power production. Thus nuclear power production proportion far exceeded nuclear power capacity proportion due to the improvement of up to 78.7 per cent in total nuclear power availability since commercial operation of nuclear unit No.5 started in 1985. Table 6 gives a broad outline of Korea's nuclear power programme.

There are several significant features of Korea's nuclear energy development programme. It seems to have been dominated by US capital and technology. Most of its reactors have been financed fully or partly with US finance for example, "By the end of 1980, EXIM banks cumulative nuclear commitment

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29. The Korea Herald, 12 April 1987.

Table 6

KOREA'S NUCLEAR POWER PROGRAMME

S.No.	Site	Output	Type of Reactor	Year of contract	Contractor	Domestic Fund (m. won)	Foreign Fund (m. $)
1.	Kori	595	PWLWR	1970	Westinghouse	82,680*	
2.	Kori	650	PWLWR	1977	-do-	120,518	449,938
3.	Wolsung	678	CANDU	1976	AECL	282,191	679,037
4.	Wolsung						
5.	Kori	950	PWLWR	1978	Westinghouse	393,459	1321744
6.	Kori	950	PWLWR	1978	-do-		
7.	Gyaemari	951	PWLWR	1979	-do-	723,306	1136275
8.	Gyaemari	951	PWLWR	1979	-do-		
9.	Buguri	950	PWLWR	1980	Framatone	368,540	1490000
10.	Buguri	950	PWLWR	1980	-do-		

Source: AMPO, Vol.13, No.1, 1981, p.41.

*million Won.

had reached $2.5 billion out of $3.6 billion EXIM bank funds authorized to South Korea, making South Korea th bank's largest borrower".[30]

Apart from a rapid pace of development of nuclear energy, there has been constant efforts to enlarge the domestic autonomy in the field of nuclear power units. "The target is to attain 95 per cent rate of domestic control in this area by 1995, while interim goals are 22.3 per cent self sufficiency rate for reactor No.5 and 34.9 per cent for reactor No.6. However, localization figure do not include raw material inputs, which make the localization rate much smaller".[31] At present, Korea is bound to purchase uranium fuel from the country that has supplied its nuclear reactor. With the result "Korea completely relies on US enrichment services to supply the enriched uranium 235 for its four nuclear power plants presently (1982) in operation".[32]

Korean nuclear energy industry is also "working toward the establishment of facilities capable of handling all phases

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30. Peter Hayes and Tim, Shorrock, "Dumping Reactors in Asia", AMPO (Vol.14, No.51, 1982), p.19.

31. Ibid., p.45.

32. Young Sun Ha, n.23, p.103.

of nuclear fuel production in conjunction with nuclear power projects".[33] In order to secure adequate supply of nuclear fuel, Korea has started investing in uranium mines overseas on a development and import basis since 1976.

Yet another feature of the sector is the increasing involvement of leading industrial houses such as Hyundai Yanghang, Daewoo and Tehan Cables. In November 1976, Hyundai Yanghang concluded a production technology licensing agreement, for the manufacture of turbine generator for nuclear and conventional power plants, with General Electric Corporation. In April 1977, the Taehan Cable Works agreed with Becktel Corporation of the US to establish an engineering joint venture. Another example is Hyundai Heavy industries Ltd., that entered into an agreement with Westinghouse and other companies in October 1978.

Energy resources, both indigenous and imported, have played a crucial role, in attaining the rapid pace of economic development in Korea. However, most of its energy demand was fulfilled by imported fuel, especially oil. It will, therefore,

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33. AMPO (Vol.14, 1982), pp.45.

be useful to examine the nature of the international oil crises and its impact on the Korean economy. To what extent, the hikes in oil prices have influenced the consumption and development of other energy resources.

Chapter III

THE IMPACT OF THE OIL CRISES ON KOREAN ENERGY POLICY

The rapid pace of industrialization in Korea is mainly due to the expansion of chemical and heavy industries. Oil, being the fuel source for these industries, Korea's dependency on oil increased with the years. Korea, therefore, had to spend a major share of its foreign exchange reserve on the oil import bill. Its import bill grew significantly with the rising prices of oil, and affected Korea's balance of payments adversely. The volume of imported oil and the resultant import bill are shown in the following table (Table 1).

Table 1

OIL IMPORT OF KOREA

Year	Oil Import			Total import (m.$) (B)	A/B %
	Crude oil (1,000 barrel)	Crude oil (million $) (A)	Oil products		
1964	5,835	13	2,785	404	3.2
1970	69,150	119	88	1984	6.0
1974	112,703	1105	1,617	6852	16.1
1978	166,532	2174	3,540	14972	14.5
1981	182,816	6504	13,161	26131	24.9
1983	192,969	5768	21,697	26192	22.0

Source: Ministry of Energy and Resources, Office of Customs Administrations.

It is clear from the table above that except for the period 1981-83, oil import bill has registered an increase. As a result, the percentage of oil in total imports has increased over the years, with the exception of years 1981-83. The fall in the import bills was mainly attributed to the decline in oil prices in the early 1980s as there was more of supply than demand in the international oil market. Korea imported most of its oil requirements through international companies especially American companies that were involved in joint ventures in Korea.[1] Thus since the early 1960s the Korean economy came to be inextricably linked with the world oil economy in general and the Middle East Oil market in particular.

The international oil market was dominated by the international oil companies, commonly known as 'seven sisters' (Exxon, Gulfoil, Texaco, Mobil, Socal, British Petroleum and Royal Dutch Shell), before the emergence of OPEC. They fixed the posted prices for crude oil as well as allocated the pro-rationing of the oil output to agreed levels in crudes to maintain the world oil prices.[2] The increasing

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1. Hongkong Standard, 11 December 1973.

2. See Pierre Terzian, OPEC: The Inside Story (London, 1985), pp.8-37.

dominance of these oil companies plus the emergence of other oil producing countries, particularly, the Soviet Union, resulted in oil glut and declining oil prices. The price of oil that came down to around $1.5 per barrel, alarmed the major five oil-exporting countries, responsible for 80 per cent of the non-socialist world's exports. To deal with the prevailing condition in the world market, these five countries, i.e., Saudi Arabia, Iran, Iraq, Kuwait and Venezuela, met on 9 September 1960, and formed the Organization of Petroleum Exporting Countries or OPEC.[3] This newly formed cartel of exporting countries, emerged as a powerful group against established international cartels, and was successful in preventing any further reduction in the posted prices of oil. The rise in the membership of OPEC, from five to thirteen, shows their growing power and strength, which they have used in later years.

In 1969, the Libiyan government demanded increased prices for its oil exports. Oil companies, having agreed to increase its posted prices, resulted in the OPEC meet on 9 December 1970 in Caracas. At this important meeting OPEC presented a collective demand to the international oil

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3. Ibid., pp.38-64; also see Walter J.Levy, Oil Strategy and Politics, 1941-81 (USA: 1982), pp.156; also see Paul Hallwood and Stuart Sinclair, Oil, Debt and Development (London, 1981), pp.42-43.

companies for increased royalties and taxes on their oil production. This led to the Teheran Agreement of February 14,1971, when the posted prices were increased by 20 per cent.[4] It signified the importance of oil exporting states as a producer's cartel and their dominant position in the international oil market. However, the Teheran agreement could not last long. The startling increase in the demand for oil among industrialized countries, Arab-Israeli conflict and world wide shortage of oil in 1973, resulted in the premature death of Teheran Agreement.

In the Kuwait meet (October 1973), OPEC unilaterally raised the oil prices to $5.12 a barrel, which was further raised to $11.65 a barrel on 22 December 1973. In the OPEC-Persian Gulf Members meet in Teheran, Saudi Arabia announced a cutback of 10 per cent in production, which was more than 20 per cent in reality. Furthermore, Saudi Arabia imposed an embargo on USA and Netherlands, as accused of supporting Israel. Justifying the sharp rise in prices, OPEC stated that it was not bound by any agreements.[5] According to OPEC,

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4. Charles F.Doran, Myth, Oil and Politics (New York, 1977), pp.35 and 59.

5. Robin C.Landis and Michael W.Klass, OPEC: Policy Implications for the United States (New York, 1980), pp.39-40.

the price of oil was raised according to the supply and demand conditions of the market. All in all, OPEC realised the value of oil and used it as an effective instrument against the oil importing nations. This quadrupling of prices in 1974, affected adversely the trade balance of most of the developing countries.

Korea, too experienced the shock of the oil crisis. "As Korea was obliged to buy crude oil mainly from Saudi Arabia and Kuwait through U.S. oil suppliers, the oil price hikes by Arab oil producing nations brought about a sharp increase in Korea's foreign exchange spendings on crude oil. In fact, Korea's crude oil import prices were raised from $2.80 to $4.26 per barrel on an average i.e. about $200 million more a year.[6] Price index of major energy products, for example, fuel oils, lubricating oil and other petroleum oil registered an increase almost in the same ratio, as prices raised by OPEC.[7] The increase in the oil prices affected the GNP growth rate adversely. The GNP growth rate that was 16.7 per cent in 1973 dropped to 8.7 per cent in 1974 and 8.3 per cent in 1975.[8] Trade deficit increased to

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6. Korea Annual, 1974, pp.103.

7. Yearbook of Energy Statistics, 1987, pp.312-17.

8. See Table 1 in Chapter I.

$1,937 million in 1974, from a level of $566 million in 1973.[9] Considering the sudden spurt in oil prices, a need was felt to introduce some changes in the industrial structure and reduce dependency over oil in coming years. Moreover, the total expenditure in importing oil grew with years, as could be seen from the Table 2.

Table 2

IMPORT OF PETROLEUM IN KOREA

Year	Expenditure (in '000 dollars)
1962	539
1976	1,610,452
1977	1,952,559
1978	2,186,987
1979	3,100,144
1980	6,185,347

Source: Korea Annual 1981, p.186.

What is significant to note is that despite a sharp increase in its oil import bill, Korea continued to experience a high rate of economic growth. That is why Korea did not seriously consider the necessity to change

9. Korea Annual, 1976, pp.119-120.

its industrial structure. A significant factor to overcome the oil crisis and to maintain the desired rate of growth was the Middle East construction boom, which followed the oil crisis of 1973. As a result of which the trade gap between Korea and Middle East narrowed down considerably. Prior to the 1973-74 oil embargo, Middle East imported less than two per cent of Korean exports. "...since 1977 the Middle East accounts for over 10 per cent of the total Korean export market, and between 15 and 20 per cent of the total Korean import market, on an annual basis",[10] as is evident from Table 3.

Table 3

KOREAN-MIDDLE EAST TRADE

Year	Import ($1,000 US)	Share	Export ($1,000 US)	Share
1974	985,773	14.3	141,319	3.2
1976	1641,347	18.7	749,517	9.7
1978	2233,345	14.9	1445,633	11.4
1980	5445,000	24.4	2006,000	11.8
1982	5058,000	19.8	2544,000	11.4

Source: IMF Directions of Trade: 1983 Yearbook, pp.242-43.

It was the impact of the economic boom felt by Middle East that contributed substantially to Korean economy. The

10. Korean Economic Yearbook,1982 (Seoul,1981), pp.54.

significant inflow of foreign exchange added to the Korean foreign exchange reserves and improved the growth rate of GNP. The foreign exchange earnings from the overseas construction was only $344 million in 1976 and increased to $1825 million in 1980 (Table 4).

Table 4

CONTRIBUTION OF KOREAN MIDDLE EAST CONSTRUCTION

	1976	1978	1980	1981
Growth rate of GNP (in per-centage)	11.5	10.8	*	10.3
Foreign exchange from overseas construction (in million $)	344	1730	1825	2102

Source: Korean Overseas Construction Association, Five Year History of Overseas Construction Association (Seoul 1982), pp.7-8.

*Negative growth in 1980.

The idea of encouraging energy savings industries did not gain momentum. Korea continued to pursue the expansionary policies instead of taking restrictive measures. In fact, from the Third Five Year Plan (1972-77) onwards, the government shifted its emphasis towards the development of chemical and heavy industries such as steel, shipbuilding, machinery making and expansion in the petro-chemical products.

These industries were considered to be the backbone of Korean exports. In order to reap the benefit of expanding exports, it was imperative to develop chemical and heavy industries. Throughout the 1970s, a huge amount was invested to develop these industries, as a result of which oil consumption grew by 94.2 per cent in the period 1973 to 1979. Reduction in trade balance (to the level of $477 million in 1977), and improved growth rate of GNP (14.1 per cent in 1976) seem to have justified the expansionary policies adopted by Korea.[11] Ministry of Energy and Resources adopted some measures to ensure steady supply of oil in future. For example, the state run KECO "placed orders for 33,000 tonnes of bunker-oil to Middle East countries as an emergency measure to secure fuel for its thermal power stations".[12] Korea also planned for strategic exports of cement and started negotiating with Middle East countries for various joint ventures. The joint ventures proposals were part of Korea's "effort to establish close economic relations with oil producing Arab countries under a new policy by 'resource

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11. Ecusaon Shin, "Energy Supply Policies in Korean and Japan", in Dalchoong Kim (ed.), Energy Policies in Korea and Japan (Seoul, 1986).

12. Hongkong Standard, 11 December 1978.

diplomacy'."[13] Moreover, years following the oil crisis of 1973 were comfortable in view of the stable oil prices and Korea continued to import oil at increasing rate.

The relatively comfortable situation of oil prices did not last long. Stagnant demand and revenue led directly to the price increases. Spot prices rose in late 1978 as Table 5 would indicate.

Table 5

OIL PRICES PER BARREL (IN $)

Year	Price
1973	3.39
1974	11.28
1975	11.02
1976	11.76
1978	12.93
1979	18.67
1980	31.10

Source: Citibank, Monthly Economic Letter, January 1981.

Increment in 1978 was negligible in comparison to the price rise in the year 1979. It was basically due to the policy of direct production control. "Saudi Arabia took the first

13. Financial Times, 3 April 1974.

step by fixing at 65:35, the proportions of light and heavy crude".[14] The disturbance of 1978-79 in Iran resulted in the reduced supply of crude oil by about 4-5 per cent. Saudi Arabia cutback its production initially in January and further in February 1979. In order to raise prices, output was held below demand, which resulted in soaring spot prices.[15] The oil revenue of the thirteen OPEC member states in 1979 "were some 72 per cent than in previous year and about 120 per cent above 1974. The main cause of this huge increase was the surge in average export prices, including the practice of charging various fancy extras over official rates and the cutting of contract deliveries in order to sell more on the spot market".[16] It was thus clear that OPEC used oil as an effective means to utilise the existing market condition and earned substantial amounts. Moreover, there was a sharp difference between the official and spot prices. While the official price in 1979 was around $15.0 per barrel the spot price was more. This policy of discriminating prices added to the foreign exchange reserves of OPEC members.

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14. M.A.Adelman, "Oil in the Eighties", Petroleum Economist (October 1980), pp.414.

15. Pierre Terzian, n.2, pp.274-76.

16. Petroleum Economist, June 1980, pp.243.

In comparison to $539 thousand in 1962 and $3,100 million in 1979, Korea spent $6185.3 million in 1980 for its oil imports. "The 1980 oil import amount represented an excess of 69.4 per cent more than 1979. Such a rise in oil import costs was ascribed mainly to soaring prices. Korea paid an average of $29.65 per barrel of imported oil in 1980".[17] The soaring import bill had an adverse effect on the overall economy in general and balance of payments in particular.

Compared to the first oil crisis the impact of the second oil crisis was deeper and longer. "In 1978, Korea realized an annual GNP growth rate of 9.7 per cent. In 1979, the GNP grew moderately at 6.5 per cent but it plunged to minus 5.2 per cent in 1980".[18] Since 1962, when Korea opted for export led industrialization the first negative growth rate of GNP was registered in 1980. Though Korea had experienced negative trade balance in previous years, yet the oil price hikes had made the situation worse. "From 1978 to 1979, total imports increased $5,367 million while total exports increased by

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17. Korea Annual, 1981, pp.189.

18. Euisoon Shin, n.11, pp.5.

only $2,345 million. As a result, Korea recorded a trade deficit of $4,396 million in 1979. In 1977, the trade deficit was only $477 million".[19] And inflation soared to 28.7 per cent measured in consumer prices and 38.9 per cent measured in whole sale prices.[20]

Internal disturbances in Korea, further aggravated the situation, especially after the assasination of President Park on 26th October 1979 and the disastrous harvest of 1980. "In addition subsequent worldwide recession limited the growth of Korea's exports, as demand for Korean goods declined in the world market".[21] In 1979 itself a stabilization programme was announced by the government, but with no fruitful results. In addition to this, a long term energy plan was announced by the Ministry of Energy and Resources in 1979. The major objectives of this plan were to secure a stable supply of energy sources, to promote overseas direct development of energy sources and evolve an oil stockpiling policy. Emphasis was laid on anthracite coal in order to reduce dependency on oil in future. As we have seen earlier, instead of anthracite

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19. Ibid., pp.5.

20. Kim Kihwan, The Korean Economy (Korea, 1985), pp.19.

21. Ibid., pp.18.

coal, it is bituminous coal that forms a major share of the industrial intake. The consumption of bituminous coal was increased in Korean industries with increasing crisis in oil market. (Table 2, Chapter II). Imports of LNG and LPG were preferred and nuclear power was considered to be the most reliable source of energy in future. Next important objective was conservation of energy.

For fulfilling this purpose, "The Energy use rationalization law" was enacted in December 1979. In 1980, an Energy Management Corporation was established to accelerate work on the conservation of energy. Work was started immediately on this front for example, "In 1980 the government held joint meetings of natural resources cooperative committees with Australia, Columbia and Indonesia under a programme to step up its cooperation with resources-rich countries. During the year, 13 Korean firms including POSCO continued to promote the joint development of mineral resources in 17 projects in 11 countries including the US and Australia for re-import into Korea".[22] In 1981, an agreement was signed between Korea and Indonesia to develop petroleum resources in the West Madura offshore bloc in East Java. The protocol was signed between the Korea

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22. Korea Annual 1981, pp.187.

Development Co. (KODECO) of Korea and Pertomina of Indonesia on a 50:50 basis.[23] The main objective of this protocol was to explore an exploit jointly the oil resources of Indonesia. Among the various successful co-operation agreements signed between Korea and Indonesia "one of the biggest is the start of LNG deliveries to South Korea this year (1986) at 2 million tonnes per year for 20 years. South Korea has agreed to step up coal imports in 1986 from Indonesia to 100,000 tonnes compared with 60,000 tonnes last year".[24] Joint venture with Indonesia proved to be a successful and pragmatic experiment in intial years. However, when the oil prices experienced a sudden decline in mid-1980, the Ministry of Energy and Resources was compelled to negotiate once again with Indonesia. "Korea wanted to improve the terms of the 20 year contract that the two sides signed in 1983. It was reported that the Korean government was threatening to revoke the bilateral contract for the importation of Indonesian LNG unless Indonesia brings the price of the clean gas down to the spot market level".[25]

The initial success of the LNG project, prompted Korean Government to institute the oil development Fund in

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23. Korea Annual 1986, pp.148-49.

24. Ibid., pp.149.

25. Korea Herald, 8 June 1986.

1983 to promote domestic and overseas oil development activities. As of 1984, Korea was involved in five ongoing overseas oil development projects. In particular, the Maribu Mining area in North Yemen, where the consortium of Hyundai, Korea Petroleum Development Company, Samwhan and Sun Kyung operate with Hunt Company of America, has shown promising signs of commercially feasible oil fields.[26] For additional capital, loans were raised through Korea EXIM bank or the Korea Industry Bank. The Korean share in all the five projects is not equal. For example, its share is highest (75 per cent) in the Daeshin Oil Development Project (See Table 6).

Table 6

OVERSEAS OIL DEVELOPMENT PROJECT OF KOREA 1984

Company	Area	Operator	Korean share	Remark
KODECO	Madura (Indonesia)	KODECO (Korea)	50%	Started Production
Daeshin Oil	Oklahama (USA)	LAMIE (USA)	75%	Under exploration
PEDCO, Hyundai, Samwhan, Sunkyung	Mribu (North Yemen)	Hunt (USA)	24.5%	Under estimation
Lucky, PEDCO, Honam Oil	Adang (Indonesia)	Jackson (U.S.A.)	25%	Under exploration
Samsung	Sorcewak (Malaysia)	Musky (U.S.A.)	35%	Under negotiation

Source: Korea Institute of Energy and Resources, A Study on the Overseas Resource Development Strategies of Selected Developed Countries, 1984.

26. Euisoon Shin, n.11, pp.21.

Korea is still at the beginning stage of overseas oil development as is evident from its projects. Most of the projects are operated by foreign oil companies with Korean equity participation ratio between 25 and 35 per cent in four out of five projects. Korea has yet to develop its technology in this field so as to exploit more and more oil reserves.

Oil stockpile policy has been another influential instrument in reducing the shock of sudden hike in oil prices. After the first oil crisis in 1973, most of the countries in the world raised their oil stockpile level as a safeguard against another oil crisis. Korea paid less attention in this direction and was left vulnerable to the second oil crisis. "When the second oil crisis broke out, Korean oil companies were keeping only 30 days of running stocks while Japan was keeping 87 days and Taiwan was keeping more than 60 days stockpile level".[27] Having been badly hit by the second crisis, the government realized the indispensability of oil stockpile policy. Efforts were initiated in this direction and the Korean Petroleum Development Corporation (PEDCO) was founded in 1979, to prepare the oil stockpile plans. "In the plan fixed in

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27. Ibid., pp.30.

June 1980, PEDCO prepared the following policy guidelines. By 1986, 60 days government stockpile will be accomplished and the required capital will be collected through the oil stockpile fund. The storage facilities will be mostly constructed underground but ground facilities will also be constructed for initial stockpile purposes. The government will stockpile crude oil and will guide the private oil companies to stockpile oil products".[28] Basically, it was the government that initiated all the projects in the direction of stockpiling crude oil. Contribution of private oil companies was very little. Keeping in view the growing need of oil, an oil Business Fund was initiated. It was later used in establishing facilities for the purchase, storage and exploration of new sources of oil.

In addition to the various measures discussed above, energy policy in Korea emphasized on the development of alternative sources of energy. The clear objective was to reduce dependency on oil and ease the soaring oil import bill. Among the alternative sources of energy, LNG and nuclear power occupied a prominent position. Nuclear energy development programme received momentum, and since 1978 it has started contributing to the nation's power supply.

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28. Ibid.

Korea was still working on the development of alternative sources of energy when the world market once again experienced the glut in oil supply. Official prices of crude oil were cut down in 1983 by OPEC. World market was transformed from a sellers into a buyers market. However, this situation is not going to prevail for long. According to experts, once again the world oil market is expected to become tight in the 1990s.

From the foregoing analysis, it could be seen that, despite the fact that Korea managed to face the two oil crises in the seventies, its dependence on imported oil did not decline. This is mainly due to the patter of its industrialization and the tangible improvement in the standard of living. The Korean economy will, therefore, continue to be subjected to the vagaries and uncertainties of the international oil situation, at least until the end of the century, when nuclear power is likely to emerge as a major source of energy.

SUMMARY AND CONCLUSIONS

There exists a close relationship between the pace and pattern of a country's economic development and its patterns of energy consumption. This is certainly true in the case of Korea. Since 1962 when Korea adopted the policy of planned development, a clear correlation could be seen between the rate of growth of GNP and the rate of growth of energy consumption. On an average while GNP registered a growth rate of 9.9 per cent for 1962-75 period, 5.8 per cent for 1977-81 period and 7.6 per cent for 1982-86 the total energy consumption grew at a rate of 8.5 per cent in 1963-70 period, 6.9 per cent in 1971-75 period and 6.2 per cent in the 1980-86 period.

The most striking feature to note about Korea is that in a short span of 25 years it has brought about a significant structural change. The productive forces have been rapidly developed, and a perceptible improvement was registered in the standard of living of the people. Korea achieved its success not by relying on its indigenous energy resources, but on imported resources like crude oil and bituminous coal. The reliance on imported energy was necessitated by the fact that the only available fossil fuel was anthracite coal. It has no known sources of crude oil

and virtually no reserves of bituminous coal. Since 1978, Korea has sought to develop its nuclear capacity to augment its poorly endowed energy resources. Thus the industrial transition was brought about by relying heavily on imported energy resources.

Korea was basically an agrarian economy with few significant industries to count until 1960. It was like any other developing country, beset with the problems of unemployment, high growth rate of population, poverty and low per capita income. Several factors have contributed to the economic backwardness and depressing social conditions that prevailed until the 1960s. A long colonial rule of Japan over Korea brought several distortions in the society. It was a classic case of what Theotonio Dos Santos defined dependence. The restructuring of the inherited colonial economy, in itself, is a difficult task. Furthermore, the territorial division between the North and the South had serious economic implications. In specific economic terms, the division resulted in an uneven distribution of population, land, minerals and energy resources between the two parts. According to one study, in 1940, the North's estimated share of heavy industry production was 86 per cent of the total for Korea. And by 1944, it was producing 92 per cent of the

total electric power, 88 per cent of the fuel, 78 per cent of the mineral output, 98 per cent of the metallurgical output and 82 per cent of the chemical output. Thus the division along the 38th parallel put an end to the interdependency of North and South. The situation worsened by the Korea war in 1950-53 period.

The post war period was marked by economic instability. In order to sustain the economy, the Syngman Rhee government sought massive help from the United States mostly in the form of aid. During the period 1952-1961, the United States donated 95 per cent of total foreign aid which amounted to some 8 per cent of Korea's GNP, 77 per cent of capital formation and about 70 per cent of total imports. However, despite massive injections of foreign capital no significant structural change took place in the economy. The economy had very little capacity to build its own production base. It was still agricultural in nature. As is evident from the fact that over 60 per cent of the labour force worked on farms and about 40-50 per cent output originated in agriculture. Agriculture being the prime source of livelihood, most of the energy demands were met by coal and firewood. For example, in 1962 these two energy sources constituted 88.6 per cent of the total energy consumption. The economy was self-reliant in terms of energy resources. However, Korea failed

to maintain this degree of self reliance in the post-1962 period.

A major shift took place in the energy consumption pattern as a result of the implementation of five year plans since 1962 and installation of heavy industries. All the five plans were successful in attaining their targets and the credit for this goes to the state. As a result of which, a significant change took place not only in the structure of the economy but also in the standard of living of the people. The overall economic growth rate was 8 per cent per annum in 1962-85 period, while the per capita GNP rose from $87 to $2032 in current prices, over the same period. The industrial sector registered an annual average growth rate of 13 per cent. With the increase in the number of industries, a need was felt to develop energy resources simultaneously. Being a producer of antracite coal only, Korea had to import oil and bituminous coal for its industries. In Korea, anthracite coal is used in the residential area for heating purposes. Whereas for industries, it is the bituminous coal, that is very much in demand.

The tremendous increase in the consumption of energy was primarily due to the very nature of the industries.

The demand for bituminous coal increased with the development of the cement and steel industries. On the other hand, industries like petro-chemicals automobiles and other heavy industries have used petroleum as fuel, Korea's dependency on imported fuels increased, especially in the late 1970s and the early 1980s. This is evident from the fact that Korea's Reliance Ratio on imported fuels rose from 58.8 per cent in 1975 to 76.4 per cent in 1985.

In 1962, oil was in abundant supply in the international market. Comparatively, the cost of purchasing oil was less than the cost of development of alternative sources of energy. In fact, the availability of oil at relatively cheap price was a contributing factor in setting up heavy and chemical industries. Apart from industrial sector, the demand for oil increased in the residential and household sector. It was mainly attributed to the increase in employment, per capita GNP and improved standard of living. This fact could be seen in the following example. The number of total passenger cars in Korea, rose sharply, especially in the post-1970 period. The total number that was 13,668 in 1970 rose to 262,775 in 1985. It is obvious that the increased number of cars would affect the demand for petrol. The total import of crude oil rose tremendously in 1962-1985

period. The total import that was 11,170 thousand billion barrel in 1965 rose to 198,313 thous and billion barrel in 1985. Most of the imported crude oil came from the Middle East.

The first oil refinery was set up in 1964, at Ulsan, with a capacity to process 35 thousand barrel per day. The basic objective was to utilize international comparative advantage in the purchase of crude oil. It was a joint venture between the Korean government and the Gulf oil company of the United States. The Government continued to expand the oil refining facilities. As a result of which five refineries were in operation and their total capacity was 790 thousand BPSD as of the end of 1985. This was more than 22.5 times the 35,000 BPSD level in 1964. A significant fact regarding these refineries was that four out of five were in collaboration with the Transnational Companies of United States.

In the reshaping of the Korean economy, the export sector played a decisive role, as is evident from the fact that the ratio of exports to GNP was more 4 per cent in the early 1960s but it rose to over 40 per cent in the early 1980s. To establish exports as the leading sector of the economy it was the government that played a crucial role in

importing foreign technology and arranging for foreign capital. Since the mid-1960s Japan and the US emerged as a major source of technology and capital mostly in the form of loans, foreign direct investments and trading partners. Like any other sector, the energy sector was also mostly controlled by the government. It was the government that determined the number of projects, eligible trading partner, needed capital and technology. At the distribution level, prices of coal, petroleum products etc.were also controlled by the government. In fact, to encourage the consumption of anthracite coal, huge subsidies were provided for its production. However, a policy of dual pricing was adopted in the case of consumption and exports of petroleum products.

The rapid rate of industrialization had its impact on the power generating facilities that increased from 434 MW in 1962 to 17,570 MW in 1986. In fact it was the Korea Electric Power Corporation (KEPCO) that was responsible for power generation for both conventional and nuclear plants. In laters years, KEPCO was engaged in coal and tungsten mining, fertilizer production and oil refining, and further widened its area by launching ship building, automobile assembly and steel making ventures.

Korea's position, with regard to energy resources, both imported and indigenous, was relatively sound till 1973. In 1973, OPEC countries suddenly announced a four fold increase in oil prices, so that it rose to $11.28 from $3.39 per barrel. The Korean economy was badly affected by this sudden increase in prices. Its crude oil import prices were raised from $2.80 to $4.26 per barrel on an average. As a result of which, the trade deficit increased to $1,937 million in 1974, from a level of $566 million in 1973. However, expanding industries and enhanced export earnings with the Middle East construction boom, helped Korea in mitigating the adverse effects of 1973 oil crisis. The oil crisis did not deter Korea from pursuing the expansionary policies based on heavy industrialization. It is also significant to note that, after the dramatic quadrupling of the oil prices in late 1973, there was a relative stability in the international oil prices. This might have been one of the factors that contributed to the recovery of the economy after the set-back of 1974.

The situation worsened once again in 1979/80, when oil prices once again soared. The per barrel cost rose from $18.67 to $31.10. Compared to the four-fold increase

in the prices in 1973, the prices in 1979/80 rose to less than double. But its impact on the Korean economy was much deeper. Korea had to pay an average of $29.65 per barrel in 1980. Consequently, its total expenditure on imported oil came to the order of $6185.3 million in 1980, whereas the total expenditure on imported oil was only $539 thousand in 1962. One of the consequences of the second oil crisis could be seen in the fact that Korea recorded a minus 5.2 per cent growth rate in 1980. President Park's assasination in October 1979 and the failure of the harvest in 1980, also contributed to the sluggish growth in 1980.

The scarcity of oil, fluctuation in the international prices of oil, uncertainty over a steady supply of oil and rising import bills, compelled Korean policy makers to introduce some basic changes in their energy policy. The most significant change was seen in the accelerating up of nuclear power and natural gas programmes. Nuclear energy, non-existent up to 1977, contributed 7.4 per cent of total consumption of primary energy in 1985, and 20 per cent of total generation of electricity in 1984. At the end of 1985, Korea had four nuclear units in operation. The total capacity of these units was 2,866,000 KW, that contributes

17.8 per cent of Korea's total power generating facilities. The United States has provided significant help to Korea's nuclear power programme a success. The government has planned to install a total of 11 nuclear power plants by 1991. With a view to securing adequate supply of nuclear fuel, Korea started investing in overseas uranium mines on a development and import basis since late 1974.

The share of natural gas in total energy consumption increased from 1 per cent in 1962 to 5.6 per cent in 1986. In 1980, the government held joint meetings of Natural Resources Co-operative Committees with Australia, Columbia and Indonesia. An agreement was signed between Korea and Indonesia to develop petroleum resources in the West Madura offshore bloc in East Java. The main objective of this protocol was to explore and exploit jointly the oil resources of Indonesia. One of the biggest co-operation agreements, was the start of LNG deliveries to Korea in 1983 at 2 million ton per year for the next 20 years. The success of joint venture with Indonesia in the field of energy resources prompted Korean government to institute the oil development activities. At the end of 1984, Korea was involved in five ongoing overseas oil development projects. In the field of oil development business, Korea is at the beginning stage.

Most of the Korean projects are funded and operated by foreign oil companies.

In the case of oil imports, Korea sought for a diversification in the markets. However, Korea's diversification in the market is purely in terms of geographical location. Initially Kuwait and Saudi Arabia were the main suppliers of crude oil to Korea. Middle East, being an area of conflict, it was thought necessary to locate new areas of oil supply. The objective was to ensure a steady supply of oil in future. This explains, why Malaysia, Indonesia and Brunei emerged as prominent supplier of oil in post-1980 period.

The very basic nature of Korea's industrial structure was such that it enhanced the consumption of oil as Korea progressed through the various stages of development. It was nearly impossible for Korea to switch over to any other energy source. Most of its industries produce manufactured goods for export markets. For example most of the petroleum products were consumed in textiles, tyre, footwear and plastic industries. These industries are considered to be strategic industries which produce primarily for international market.

In order to avoid the consequences of yet another oil crisis, Korea enhanced its efforts in the direction of oil stockpiling. In 1979, the Korea Petroleum Development Corporation was funded to prepare the oil stockpile plans. It proposed in 1980 that by 1986, a stockpile of 60 days will be accomplished and the required capital will be collected through the Oil Stockpile Fund. In the case of imported fuels, the import of bituminous coal and natural gas was preferred to oil. It was also decided to engage in mining bituminous coal in overseas coal mines. The necessary facilities were provided by the government, so that a steady supply of bituminous coal could be ensured. In 1984, Korea launched five overseas coal development projects, of which two are at the development stage and three at the exploration stage. Despite being engaged in developing oil and coal resources, Korea is laying enormous emphasis on the development of nuclear power. Korea hopes to solve the problem of a stable source of energy supply, and achieve its aim of self-reliance in energy resources through the all out efforts to develop its nuclear energy programme.

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