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THE IRON AND STEEL INDUSTRY IN PAKISTAN^{1/}

10

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^{1/} The views and opinions expressed in this paper are those of the author and do not necessarily reflect the views of the Secretariat of UNIDO. This document has been prepared with the assistance of UNIDO.

We regret that some of the pages in the microfiche copy of this report may not be up to the proper legibility standards, even though the best possible copy was used for preparing the master fiche.

1. Pakistan has been struggling for the past few months mainly to find a satisfactory solution to its steel problem. The high cost of importing all its steel requirements cannot be supported indefinitely. The non-existence of reasonably large-scale plants for the manufacture of steel has had a adverse effects on the progress of the country's economic development, which has suffered serious setbacks because of the dependence on imports. The obviously ideal solution and the one least vulnerable to fluctuations in the foreign exchange position either due to export earnings or of foreign aid would be domestic production of steel using indigenously available raw materials. On the reliance of known raw-material deposits this solution may become possible ultimately but holds somewhat limited prospects for the present.

2. For the production of steel, one has to be considered in conjunction with the use of energy sources available, i.e., coal (some), lignite or gaseous hydrocarbons, electricity etc. Pakistan is poor in the basic raw materials, namely iron and coal. There is, however, a sufficient quantity of high-grade natural gas, but its development for use as fuel or for the production of additional energy may not necessarily fit in with the overall development plans of the country where the most useful employment of the limited resources available is essential for balanced development in all fields. The investment required for the establishment of a steel plant of economic size using indigenously raw materials would be disproportionate to the present level of general development in the country.

A choice should therefore have to be made between the high cost of exploitation of local raw materials and the use of high-quality imported raw materials available in the world market at competitive prices and manufacturing the steel at reasonable prices with moderate capital expenditure. At the same time, it seems essential that every effort for developing indigenous resources, involving satisfactory techno-economic solutions for their exploitation, be found in the national interest. In this context planning for smaller-sized units in specific areas of resource availability oriented to the development of suitable processes and products with the maximum use of indigenous raw materials has been undertaken.

3. For an answer to the question as to how much of a basic steel industry can Pakistan afford at this time must include not only the cost of a new plant and facilities but also the cost of auxiliary services, which are generally not necessary for a developed country but would have to be provided in the case of Pakistan. With modern loading and unloading facilities and the use of high-capacity carriers, a sea-coast location of a steel plant can enable utilization, at very economical costs, of the highest-grade raw materials. Japan affords the typical example of a country which is dependent for the major portion of its raw materials on imports. On an average Japan imports about 90% of its requirements of ore, 70% of coal, all its fuel oils, as well as substantial quantities of scrap and pig iron. Coastal plants are built in this country on land which is reclaimed from the sea at very high costs, artificial harbours are provided, and yet this country is the third largest manufacturer of steel in the world at present and is able to dispose of its production at fully competitive prices in the world markets.

4. Pakistan lies at providing, as the first phase of its efforts for the establishment of a steel-making industry, plants of capacities commensurate with the country's resources, and the economics of production. A million ton capacity plant utilizing high-grade imported raw materials is planned for a coastal location at Karachi. In addition, smaller units ranging from an annual capacity of 20,000 to 80,000 tons are planned for different locations in the country for manufacturing alloy and carbon steels, utilizing scrap and the raw materials available in the country.

ECONOMIC GROWTH

5. Pakistan has by now passed through three successive five year plans for development and is at present implementing the 4th plan. These plans cover the periods; upto 60, 60 - 65, 65 - 70, and 70 - 75. During the first plan period, the institutional framework of developmental activities in the public sector was laid and the building of infra-structure began. The 2nd and 3rd plans covering the period 60 - 70 made a profound impact on the economic development of the country. Despite reverses on account of hostilities in 1965, for the 8-year period upto 67-68 the gross national product had increased by 55%, agricultural production by 40%, and industrial production by 160%.

6. Towards the latter part of the third plan period, however, it became difficult to maintain the tempo of sustained growth. Resource constraints tightened and the flow of foreign assistance slowed down. A critical review of the economy shows that the tempo of development achieved over the last two decades has been disrupted during the first two years of the fourth plan (70-75), again on account of hostilities and other unfavourable circumstances. In view of the changed situation, a re-orientation of the

planning, strategy and re-ordering of the priorities has been undertaken. The attempts at economic recovery have been preceded by a number of reforms in the basic structure of the economy. These reforms have covered the re-ordering of social relationships on the land, a new set of rules for labour/management relations, a redefining of the boundaries of the public sector in industry, nationalization of life insurance, articulation of new policies in the education and health fields, liberalization of import policies and, most important of all, the devaluation of the Pak Rupee and the abolition of the bonus voucher scheme. The reforms have succeeded in assembling the necessary ingredients for rapid economic recovery in the country.

7. Even with many setbacks during the past 10 years, the G.N.P. at constant factor of 59-60 has risen by 70%. The contribution of agriculture to the G.N.P. was 45% and that of manufacturing and construction industries about 17% in 70-71.

8. The country's economy is based largely on agriculture, which produces over 1/3 of gross products, accounts for about 45% of the export earnings and of the total 60% of the labour force. The performance of this sector, unlike others, is highly sensitive to weather conditions—specifically to the availability of the irrigation supplies. With the object of achieving speedy advancement in such agrarian economies, a national solution between intensive promotion of the agrarian economy on the one hand and industrialization on the other is to be found. The agrarian industry has not only to secure the food basis of the quickly growing population but also to help the country in the ever-increasing export of the agrarian raw materials through intensive cultivation. A proper balance between agricultural and industrial growth is an essential pre-condition for a smooth and un-interrupted

growth of economy which conspicuously lacks in certain basic industrial raw materials. In our situation, agricultural growth re-inforces industrial expansion by providing raw materials an expanding domestic market and substantial proportion of the foreign exchange required for development. Similarly industrial growth creates a demand for agricultural raw materials, contributes to export of manufactured goods, leads to substitution of imports, provides a substantial portion of the savings for future development, and absorbs a part of the growing labour force. The successful achievement of these aims makes it imperative that a balanced development of agriculture be maintained, and to do so introduction of intensive mechanization in the agricultural field becomes indispensable and has already received close attention all over the country. In order that these activities are fully sustained, the establishment of a key industry like steel manufacture assumes paramount importance.

9. Manufacturing is the second largest sector in the economy in terms of its contribution to the gross domestic product. Currently it accounts^{for} nearly 1/5th of GDP. Within a span of two decades, Pakistan has attained self-sufficiency in a large variety of manufactured goods. A vast programme of development of industries of the inter-mediate goods and investment goods categories has already been taken in hand. The country has established a basis on which the superstructure of sophisticated steel and engineering industries can be erected. The programme for the establishment of steel mills and connected industries is therefore in harmony with the alignment of our industrial programme.

REQUIREMENTS OF STEEL

10. Pakistan would probably rank amongst the countries with the lowest per capita consumption of crude steel in the world. This is rated at about 8.5 kg. per capita at present. The imports of steel into Pakistan over the past 10 years, namely, 61 - 70, have averaged at about half a million tons annually. The imports have fluctuated, and sometimes violently, from year to year, primarily because of the non-availability of foreign exchange and the imposition of restrictive import policies by the Government. In addition, the tying-up of steel procurement with the country offering financial aid has been known to generally increase the cost of steel, thereby adversely affecting the quantum of steel that can be imported with the available foreign exchange. In view of these circumstances, the import figures do not correctly reflect the requirements of the country nor can the pattern of the past imports form a satisfactory basis for projecting the future requirements of the country.

11. The demand for finished steel products in a developing country at a given period of time is closely related to developments in the various sectors of its economy. Usually in a developing economy the demand in the earlier stages may be largely for bar and rod material and may gradually develop into that for flat products, which has a tendency to grow faster than that for non-flat products. The building and construction industry is active in the early stages of industrialization and this promotes the use of bars, light sections, galvanised roofing materials,

steel rails and other railway materials, the need for the development of the railway system, tubes and pipes for the oil and gas industry, tin-plate for the canning industry, and wire products associated with animal husbandry and agricultural farm programmes. The growth in the demand for steel products occurs with the setting up of light and heavy industries with assembly and manufacturing of machinery, machine tools, ship-building, household goods, and automobiles. Experience in both the developed and developing countries suggests that the establishment of steel plants and consequential easy availability of steel products tends to encourage the growth of steel consumption. In Brazil, steel consumption rose from 24 pounds to 44 pounds per capita in the first 5 years of the completion of the country's first large steel mill. In Chile a rise per capita of 150% was experienced in a corresponding period.

12. The requirements of steel in Pakistan have been the subject of very careful market surveys and studies over the last few years by consultants of international repute and organization of the United Nations. The projection of requirements in accordance with these surveys have varied from 1- 2 million tons for 1975 and 1.6 to 5 million tons for 1980 based on the level of imports and the usual assumptions for developing Asian countries in respect of growth rates in population and per capita income. The projection of requirements for West Pakistan on the basis of the most conservative estimates are :

	1970	1975	1980	1985
Total steel (tons per year)	800,000	1,170,000	1.7 mil.	2.6 mil.
Consumption per capita	9.5	11	13	20

The forecasts of projections shown above may be distributed broadly into products as follows:

	PER CENT			
	1970	1975	1980	1985
Billets	57	56	52	48
Medium and heavy Sections and rails	13	12	13	15
Sheets and plates	30	31	35	37

15. The projections of requirement indicated above reflect a growth rate of about 10% per annum, an increase in population of about 25% annually, and a per capita consumption increase from 9.5 to 20 by over a period of 15 years. Compared to other developing countries with identical conditions but with larger resources where growth has been planned to increase from about 7% to 10% per capita over a period of about 20 years, ours are but modest estimates indeed. Viewed in the light of the conservative projection of requirements, and other considerations of national importance it seems clear that the market for iron and steel in the country is large enough to sustain a domestic steel industry.

STEEL MANUFACTURE

14. The existing installed capacity for the manufacture of steel in the Pakistan is estimated at about 140,000 tons/annum, derived largely from 9 electric arc and induction furnaces ranging in capacity from below 2 tons to below 15 tons and using imported pig iron and scrap. In addition, capacity of approximately 30,000 tons, under consisting of over sixty 2 to 15 tons capacity electric arc furnace is under development, making a total of 520,000 tons of steelmaking capacity installed and under installation. A foundry and forge complex and an alloy steel manufacturing unit with annual capacities of 65,000 and 20,000 tons respectively are included in the figures of capacities shown above. Not included in the capacity data furnished is a project for the installation of a mini steel plant by the Pakistan Industrial Development Corporation with a capacity of 80,000 tons per annum, using indigenous ores and other raw materials. This proposal is being actively pursued with foreign assistance and the plant is expected to be in operation in 2-3 years' time.

15. The raw material for the electric arc furnaces is to consist essentially of imported pig iron and scrap supplemented with whatever can be supplied from indigenous sources. The existing facilities are utilized to an extent of about 60% for the manufacture of ingots and billets, and the balance for castings, material for press forgings etc. The billets are utilized for rolling into reinforcement bar and merchant sections.

16. There are also a large number of small cast-iron foundries in West Pakistan that exist generally as part-units of plants engaged in different kinds of manufacturing activity and that undertake not only work connected with their line of business but also other miscellaneous work, like general-purpose iron castings, pipes and pipe fittings, requirements for sugar and cement plants etc. The estimated potential of this capacity is 100,000 tons per year.

17. There are about 140 rerolling mills in West Pakistan with an estimated annual capacity of about 450,000 tons. These mills function considerably below capacity, largely on account of the non-availability of raw material, which has by and large to be imported. The sections re-rolled are largely from 2" sq. billets and comprise reinforcement bars for construction purposes, other simple sections upto 3", and baling hoops. A few of the re-rollers can also roll sections upto 6". Limited capacity for wire-drawing has also been developed.

18. A sizeable steel and metal fabrication industry is coming up in West Pakistan. The Heavy Mechanical Complex under implementation by the Pakistan Industrial Development Corporation is expected to produce 14500 tons annually of equipment for cement and sugar mills, railway axles, road rollers, bull-dozer, and steel structures. Similarly, the Karachi Shipyard and other smaller engineering units already engaged in shipbuilding, the fabrication of structures, oil and water tanks, welded pipes are fast expanding their activities.

19. In accordance with the present plans for the installation of steel plants, the forecast of installed capacity as compared to

the likely available capacity for the manufacture of liquid steel is:

	<u>Likely availability of Manufacturing capacity</u>	<u>Likely requirements (tons per year)</u>
1970	140,000	600,000
1975	520,000	1,100,000
1980	1,600,000	1,700,000
1985	1,800,000	2,600,000

The position with regard to the net deficit resulting from the gap between the demand and supply from indigenous sources can be dealt with either with supplies from plants planned on regional bases in collaboration with friendly countries of the general geographical area or the country might itself generate during the course of time enough resources for undertaking expansion of the existing units at a much faster rate.

PLANNING OF STEEL MANUFACTURING UNITS:

20. In West Pakistan there are two sharply divided areas of consumption, which may be called the south and the north zones. The South zone is concentrated mainly in and around Karachi, whereas the North zone is spread over Lahore, Gujranwala, Lyallpur, Rawalpindi, Nowshera, Peshawar, and Multan. The areas may be stated to be within a radius of 350 miles with centres at Karachi and Kalabagh in respect of the South and the north zones. As a general principle therefore, a steel plant in each of these regions could be justified which would manufacture the requirement of the particular region

except for such items which for technical reasons may not be of the total requirements may justify concentration in one plant. Considerable additional expenditure on transport of products between the two regions could thus be saved. The consumption levels in the two zones are estimated at 40% for the south and 60% for the north zone.

21. Several attempts have been made in the past few years to examine the question of setting up a steel plant through studies by various Consulting Organisations of international repute. The objectives of the studies were to examine the prospects of the establishment of a coastally based plant in or near Karachi using imported high-grade ores and coal, along with such other raw materials of good quality as are locally available, and a plant in the north of West Pakistan based on the use of indigenous ore of poor quality and a mixture of imported and local coals available in the area. The proved reserves of the poor-quality ores in the north of West Pakistan are estimated at over 130 million tons with overall estimated reserves of over 560 million tons. A satisfactory solution would have to be found early for economically melting the chemically complex (Chamosite/Glaucosite/Siderite) ores of the area; till such time, however, as the problems connected with the country's own poor-quality ores are satisfactorily resolved a coastally based steel plant at Karachi using imported high-grade ore and coal has been planned. Fully integrated operations are proposed. The mill will, in the first instance, have a capacity of approximately one million tons of liquid steel, going up to 2 million tons in due course of time.

The present and proposed iron and steel plants are as follows:

	Estimated Cost
Rolling mills	200,000
Plate mills	150,000
Hot rolled sheets and strips in coils.	125,000
Cold rolled sheets and strips in coils.	100,000
Refractory materials.	120,000
Electric power.	105,000
Electric pig iron.	100,000

22. With emphasis on the exploitation of indigenous raw materials for steelmaking plants are being actively pursued for finding satisfactory techno-economic solutions for their optimum use. In furtherance of these national aims, a plant of 80,000 tons annual capacity is proposed for Bhadrachalam utilizing the Chitral iron ore and the Shering and Dapori coal deposits of that area. Similarly, plans for installing small-scale units in the Kailash area of the Rajahmundry are also under formulation. These would be based on the use of the Chitral deposits of iron ore and the Shering coal. Plans for utilizing Chitral iron ore deposits as well as those from the other areas of the Frontier Province are also under review. Small scale beginnings in respect of the projects mentioned will not only help in satisfactorily solving the practical difficulties in reference to the successful smelting of these ores but will also help in providing facilities for the manufacture of steel in suitable geographical locations far away from the major steel manufacturing centre proposed for Karachi.

2). In establishing the capacity and the product mix for the Karachi Steel Mill, careful consideration has been given to the installation of other units as described in the foregoing paragraphs and in view of the following important factors:

- a. that the quantities of various products are well within the conservative forecasts of the requirements of West Pakistan by 1980;
- b. that the high-grade imported iron ore on which the plant is based should as far as possible be used for the manufacture of high-priced quality steel products, viz. sheets, plates, and coils. The known deposits of iron ore in West Pakistan are stated to be unsuitable in view of their composition for the manufacture of flat products;
- c. that as a general principle, the country is not tied down to the use of imported raw materials for the manufacture of all its steel requirements for all times to come and that the possibilities for the use of indigenous iron ore, coal, and/or gas in the manufacture of relatively simpler shapes, viz. billets, bars, and sections, are not totally eliminated in future;
- d. that the number of items to be manufactured should be confined to those for which the requirements are the highest so as to ensure that the plant gives the highest possible economic production and efficient performance;
- e. that the demand of the engineering industry for flat products be met to the maximum extent possible so as to ensure that the industry set up in the country for production of engineering/investment goods works to full capacity

- and the import component of future development in terms of investment goods is reduced substantially;
- f. that the demand of the existing re-rollers in West Pakistan be met to the maximum extent practicable commensurate with the efficiency and effectiveness of the re-rolling units;
 - g. that no sections which it is possible for the re-rollers in West Pakistan to produce should be manufactured in the plant;
 - h. that the large-scale requirements of foundry pig iron may be met to the extent feasible without adversely affecting the economics of the plant.

24. The plant and processes proposed for the Karachi plant are the conventional and are based on the use of blast furnaces, LD converters for iron and steel making along with continuous casting and a modern rolling-mill plant. The plant is expected to be complete with coking ovens, material preparation and treatment plant, sintering, and the ancillary facilities. The plant is expected to go into partial production by 1977 and achieve full production thereafter in the following two years.

PROSPECTS AND BENEFITS

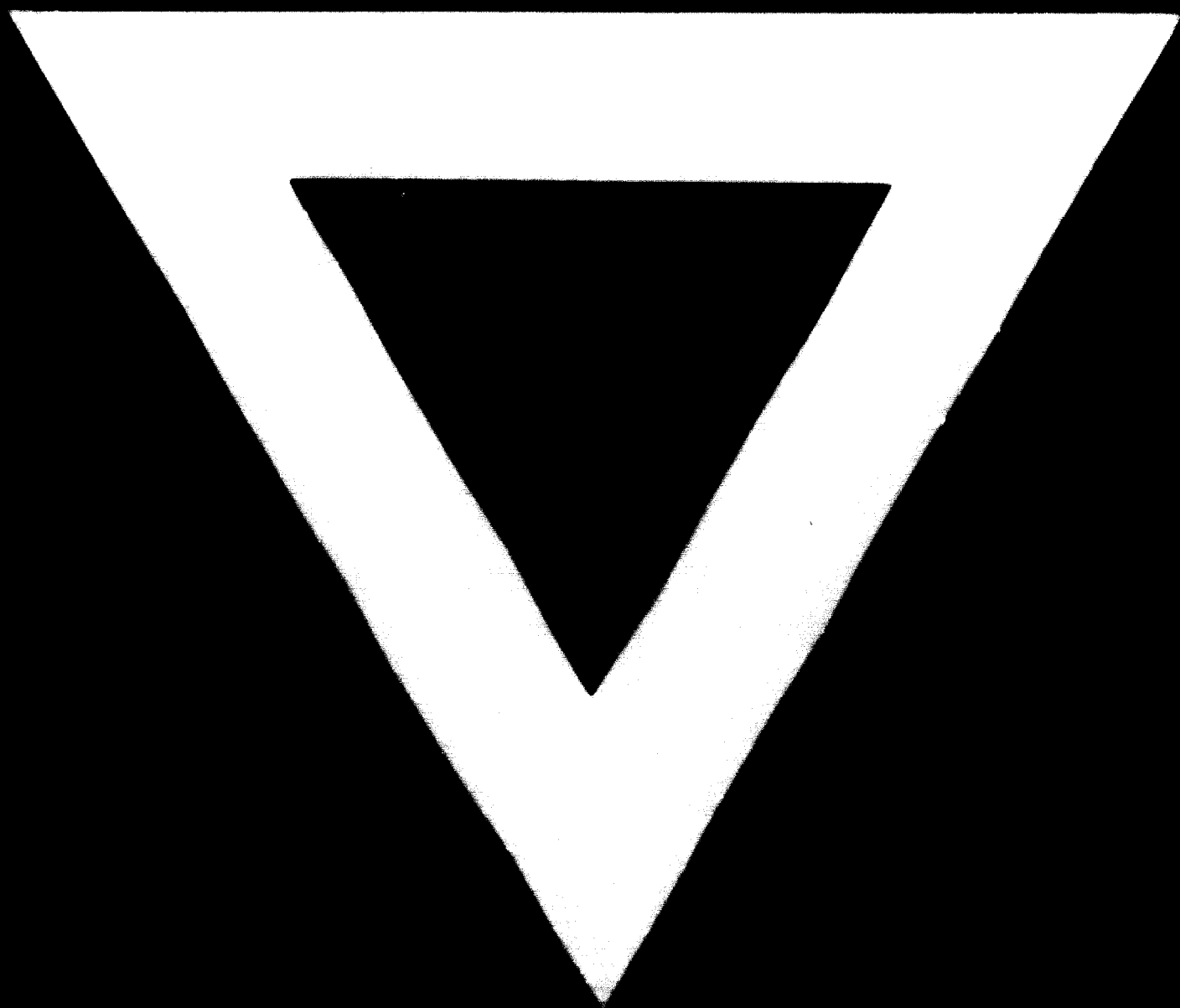
25. The economics of operation of the plant have been a subject of careful examination and assure satisfactory returns within a short while of commencing production with the sales prices fixed on the basis of the imported prices of identical products from world markets. The plant is expected to become self-financing within a short period of being commissioned. In addition, very substantial savings in foreign exchange are expected which on full

production may average to approximately Rs. 800 million annually after all debt liabilities have been discharged. The proposed steel plant is expected to impart a great impetus to the development of the country; through ensuring the availability of steel for the fast growing economy, by contributing to an increase in the gross national product and through an improvement in the general situation of employment.

APPENDIX 1 : Statistical Data on Iron and Steel Production in Pakistan

	PRODUCTION (thousand metric tons)			CONSUMPTION (thousand metric tons)		
	1972 Actual	1975 Projected	1980 Projected	1972 Actual	1975 Projected	1980 Projected
*Iron ore	-	-	-	-	-	2020
* Manganese ore	-	-	-	-	-	65
*Coking coal	-	-	-	-	-	1250
Non-coking coal	1270	1400	2000	1270	1400	2000
Pellets or sinter	-	-	1500	-	-	1500
Coke-oven coke	-	-	960	100	140	1000
Pig iron	-	-	1330	100	130	1330
Crude steel	100	520	1600	100	520	1600
Total rolled products	275	450	1400	800	1100	1700
	Proved			Estimated		
Iron ore reserves (million metric tons)	130			Over 560		
Coking coal reserves (million metric tons)	-			-		
Natural gas reserves (million metric tons)	395000			516000		

* The deposits of these raw materials are under prospecting.



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