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05168



UNIDO
11/02/1959
2 May 1960

United Nations Industrial Development Organization

ORIGINAL: ENGLISH

Third International Symposium
on the Iron and Steel Industry, 2d,
Curitiba, Brazil, 14 - 21 October 1959

Appendix Item 2

THE EXPERIENCE OF THE ARAB COUNTRIES
OF INTERNATIONAL CO-OPERATION IN
DEVELOPMENT OF IRON AND STEEL INDUSTRIES^{1/}

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^{1/} The views and opinions expressed in this paper are those of the authors and do not necessarily reflect the views of the secretariat of UNIDO. This document has been reproduced without formal editing.

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CONCLUSIONS

1) The subject is especially important for Arab Countries and international co-operation in the field of iron and steel. It is actually a broad subject and the paper represents only some pieces of the complete picture.

2) Despite the apparent differences in the items chosen for this paper, there exist the main directions and patterns common to situations relevant to the development of iron and steel industry in the Arab World.

3) Living in an age whose single constant is radical change, Nations, developed or developing, have realised the necessity of co-operation.

It is becoming clear that societies' approaches to their future is, in general, co-operation, whatever its form or level may be.

4) It is evident that our world is getting tired of the present maze of disparate and confusions. It seems that Nations are adopting now the definition of the common future!

5) It is believed that the international, inter-regional, and regional organisations are becoming clearer about this prevailing feeling about "common future". But they are not equally clear about the means to achieve this common future.

We think it is not early for these organizations to establish new traditions, review policies, and find out modern methods and viable directions to mobilize their activities as houses of knowledge and consultation assisting development towards the hopes for an interdependent future.

- 6) In the Arab part of the world, the nations are linked by the same NOTIONS for the common future.
- 7) The status of the Industrial Development Center for Arab States - An Organ of the Arab League, established in 1969 - allocates industrial cooperation amongst the Arab countries as one of its fundamental objectives.

The central policy to achieve this objective has been approved by the Board on the basis of carrying out a field study programme, the outcome of which should be deeply further discussed and studied in specialised meetings.

The iron and steel industry was on top of the priorities decided upon, as an important and strategical sector of industry playing a key role on the industrial development.

- 8) 1958 saw the birth of the first integrated iron and steel plant in the Arab world (Egypt). Today the influence of iron and steel in the Arab economy is apparent. The impact of needs for economical development are severe, and having a steel industry is not considered by the Arabs as a pride, but recognised as a potential solution for industrial development.

- 9) It is also recognised that management and manpower in the field of iron and steel in the Arab World must continue to develop to keep pace with problems and challenges already created by the modern trends and technologies in this field. The role of the international organisations in this respect should be strengthened and equivalently utilized.

As a background information on iron and steel industry in the Arab States, general report concerning the possibilities of industrial coordination and cooperation amongst them was prepared and published by the Industrial Development Centre for Arab States (IDCAS). This report was presented to the first seminar for the Development of iron and steel industry in Arab States, held in Algeria between 14th and 18th December 1970.

In this paper it is intended to cover the cooperation between the local organisations and companies with the international ones depending upon the production, importation, exportation, and apparent consumption.

The main features of Iron and steel industry in the Arab States.

At the present time there exist three integrated iron and steel plants, five semi-integrated plants, and twelve rolling plants for steel bars and steel sections.

The following table shows the three types of plants, the potential and the actual production for each one.

The existing Plants

At present there exist in the Arab World only three integrated plants, five semi-integrated steel plants, and twelve re-rolling mills.

The actual production of the three types of plants are far below the plant capacities. The main reasons for this are under-utilization such as lack of suitable raw materials, restricted working due to power shortage, etc.

The following table shows the Arab iron & steel industry - locations, capacity, and production (1972):

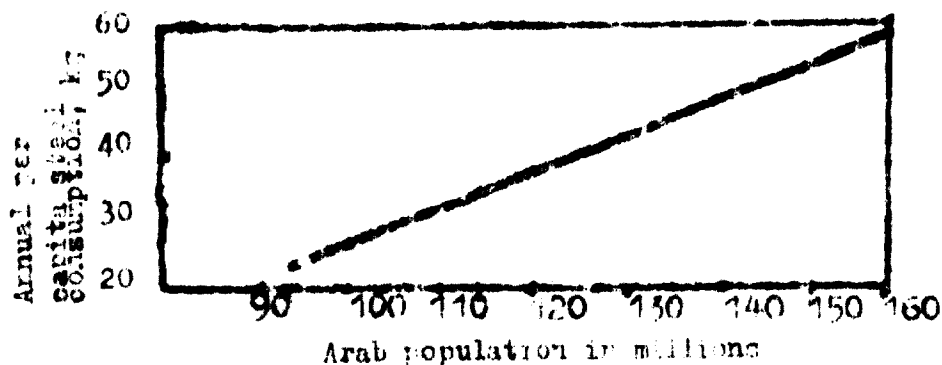
Country	IRON & STEEL PRODUCTION IN THE ARAB STATES (1972)		
	Integrated Plants	Semi-integrated Plants	1000 Tons/Year Re-Rolling Mills
Algeria	430/530	30/30	40/40
Tunisia	145/150	-	90/115
Libya	-	-	24/36
Egypt	220/265	280/420	260/300
Syria	-	-	45/60 65/110
Lebanon	-	-	190/245
Jordan	-	-	45/60
Kuwait	-	-	14/30
Saudi Arabia	-	-	12.5/45

From the above table we can conclude that all the existing plants are below their actual production capacities. The total annual production is about 1.2 million tons. On the other hand, the steel consumption is about 4 million tons. The annual consumption varies between 24 Kg. & 33 Kg. per capita. As a result of low production and relatively high consumption, most of the Arab countries, like all other developing countries, took their first steps towards economic well-being through the sale of primary commodities from their natural or agricultural resources in exchange for manufactured goods from the highly developed nations. As an example of this, most Arab countries import semi-finished steel products and some countries import finished steel products. For the sake of the national economy, the Arab countries try to establish import-substitution industries to replace some of these semi and finished goods. After the import-substitution stage is nearly reached, and when some of the Arab countries begin to shift from an inward look to an outward look for foreign markets, they find themselves with a highly distorted price structure, and with a lack of awareness of the foreign market requirements and marketing procedures abroad. The result is an information and communication gap - related to trade and technological know-how - which prevents the rapid iron and steel development which is so essential to Arab States.

Future demand for steel

The steel requirement of steel by 1975 is about 5 million tons. For a population of about 136 million, this works out to about 40 Kg. per capita.

The following graph gives an idea about the annual steel consumption related to the population:



If we compare the consumption of the Arab countries with the developed countries which have an average of 500 Kg steel per capita, we can conclude that all the Arab countries are far away beyond the international average steel consumption.

Actually, the pattern of steel consumption in Arab countries (as in other developing countries) due to rapid industrialization will be undergoing structural changes and the total volume of demand will be pushed up as a result of planned economic development. As such, it is not appropriate to forecast demand based on:-

1. Prolongation of previous rates of increase, or by
2. Linking it to a single index of industrial output, or by
3. End-use method.

The most suitable procedure is to relate the demand for iron and steel to the development of economy as indicated by:

1. Gross domestic product and
2. Capital formation

the latter being important as the major steel using sector and as determinant of the rate of growth. Such a procedure to estimate the demand may be adopted in preparing a detailed techno-feasibility report. The preparation of this report is one of the tasks of the international organisations such as the United Nations Industrial Development Organisation (UNIDO).

Co-Operation with International Companies:

We would like to define an international company as producer or contractor. Both two types willingly co-operate on the commercial basis. For the producers, they try to find a steady and open market for their products starting from ore till the finished product. Some international companies import the iron ore from some Arab countries with a price less than the international prices (according to a contract); on the other hand, there is no obligation to supply the requirements of finished steel to the exporter, which is not fair.

Concerning the contractor or designers or Engineering contractors, they are looking only for the benefit. The engineering-contractor companies try always to erect the plants

which are almost old, and cannot be erected to developed countries. Most of the Arab countries ask for financial facilities, then we can find the initial capital cost for any unit erected under such conditions double price if it is supplied under normal conditions. As examples for this co-operation, we can give **Algeria-Egypt.**

The effect of Raw Materials available in
The Arab World on International Co-
Operation

The Arab countries are short in coking coals while having vast reserves of petroleum and natural gas.

The proved iron ore reserves in the Arab countries are estimated at about 3700 million tons of 40-60% Fe according to the following table:

10^6 tons iron ore

Country	Iron ore reserves		Production per year	Exported per year
	Estimated	Proved		
Morocco	32	20	1.20	0.80
Algeria	2000	130	3.85	2.90
Tunisia	-	60	1.00	0.65
Libya	3473	-	-	-
Egypt	165	145	0.45	-
Sudan	143	19	-	-
Saudi Arabia	1556	-	-	-
Total	7369	374	6.50	4.35

The proved reserves of natural gas are estimated at 1000 billion cubic meters distributed in the Arab countries. We can consider natural gas as a partial substitute of coking coal.

The other raw materials for iron and steel industry like limestone, dolomite are found in all Arab countries. The only three exporters of iron ore are Algeria, Morocco, and Tunisia.

They are also partial consumers of the iron ore.

Concerning natural gas, most of the natural gas is exported and there is no consumption till now. The integrated plants in the Arab countries are now depending totally upon coke, except Egypt which will try to inject natural gas in the blast furnace to decrease the coke consumption. There are now many gaseous reduction processes, the product of which, whether lumpy or pulverized, can be charged directly, intermittently or continuously, to the steel making furnaces as scrap substitute, if of a certain high purity and high extent of metallization, or otherwise, to iron-making furnaces.

Although many Arab countries are thinking seriously, each on her own, of establishing this technology on their lands, we would like the technical help and co-operation of the international companies to carry out the required tests, choosing the most suitable process for each country under the supervision of UNIDO.

As a result of this item, we would like to conclude some points to be under investigation:-

- 1) Should the Arab countries depend on their iron ore and natural gas for the production of their need of steel by the blast furnace, exporting coking coal and using the natural gas only to decrease the coke consumption?
- 2) Must the Arab countries concentrate their ore either for

their industry by using one of the direct reduction processes or to export it as pellets?

3) Is it ideal to establish an inter-Arab integrated steel plant of one million tons annual production based on direct reduction? Or must be more than one plant? Or must be of low capacity?

INVESTMENT

The most important investment in iron and steel industry is the direct industrial investment of the project.

In all Arab countries the initial capital investment for Integrated Plants is about \$500 per ton. Compared this figure with plants using direct reduction (which is not found in the Arab countries), we can save more than \$300 per ton.

The factors affecting investments of iron and steel works are the following:

- 1) The availability of local raw materials.
- 2) The method used for the production of steel.
- 3) The hard currency required.
- 4) The co-operation of international organisations.
- 5) The co-operation of international companies.
- 6) The profit required from the project.
- 7) The volume of consumption compared to the actual production.

For each item we can find that different aspects affect the investment of any project, especially Iron and Steel projects.

MARKETING

Features of the market:

1. The main features of Arab Iron and steel market are the following:
 - It is not a traditional market of demand and supply.
 - The demand on steel products exceeds tremendously the local potential production.
 - With the exception of some regions of the Arab Market, the majority of the market is affected by the requirements of planned economy and the financial facilities relevant to it.
 - Making the steel and its intermediate products and making their sale is a common problem whose intrinsic merit is measured on the basis of strategic National considerations.
 - The market for the local production is not competitive as regarding the wide gap between the limited production and the great need of consumption.
 - More than 50% of the needs are covered by importation, a situation which is expected to continue for many years.
 - The average per capita consumption of steel in Kg. is very low compared with developed countries.
 - The consumption of steel products rises respectively in the following order:
R.C. bars, pipes, different sections, strips, plates, sheets, wires.

The Major Market:

2. The Industrial market is looked at as the major market for iron and steel industry in the Arab world (Hand book of Modern Marketing, Victor P. Buell).

The main products entering directly into the iron and steel industry are iron ore, (coke) and coal, limestone, dolomite, and ferro alloys. These products, except for coking coal and to some extent ferro alloys, are abundant in the Arab countries having integrated iron and steel plants. The prices of these raw materials are relevant if compared with the international market.

The following table shows the average of iron ore prices

ORE	Country	Average price per unit Fe (FOB)
Fe - (48-55%)	Algeria	10 - 16 cents
(38-44%)	Egypt	5 - 7 "
(53-58%)	Tunisia	15 - 20 "

Although some Arab Countries have coal resources, still they are of low quality particularly because of the high sulphur content. Limestone and Dolomite of suitable qualities are abundant in the Arab countries.

3. The main products of the Arab steel mills are billets, slabs, different sizes of sections and flats, round and bars, strips, wires, and pipes.

In contrast with consumer goods demand, the demand for the aforementioned goods involves a limited number of buyers such as shipyards, automotive industry, steel constructions for different purposes, civil contractors, and the oil companies for pipes.

SIZE OF DEMAND

4. The following table shows the development of demand of different steel intermediate products by each of the Arab Countries:

(Unit 1000 T)

	1965	1970	1971	1975	1980
Algeria	172.8	600	624	900	1400
Egypt	613	812			
Emirates of A. Gulf					
Iraq	245	419	498		
Jordan	89	60	82	105	185
Kuwait	127.7	148	160	260	265
Libya	147	182	220	355	420
Lebanon	239	300	371	455	520
Morocco	122.6	190	145	300	385
Sudan	52.6	68.5	87	125	150
Syria	99	306	357		
Saudi Arabia	113.8	254	303		
Tunisia	87	73	100	126	155
Yemen	50				

* Sections, bars, wires, plates, sheets, strip, pipes

SIZE OF SUPPLY

5. The supply of steel products is normally covered through the local production plus importation excluding any exportation. Comparing the demand requirements of Item 1 in this chapter with the figures of actual production given in the table attached to it, it is concluded that the Arab market is almost in great need of importation to cover about 40 - 50% of its demand.

STEEL PRODUCTS POLICY AND LONG-RANGE PLANNING

6. The steel products policy and the product line planning are concerned with what the steel plants should produce and what markets they should serve in order to relate the producers' capabilities to market demand and the conditions of economic development of the country. Most of the Arab countries are taking into consideration in their economic development plans to increase their steel output.

PRICING

7. Price behaviour of steel products

The prices of steel products, specially slabs and billets, are affected by the policy traced by the international steel monopolies. Towards this situation some Arab governments are obliged to take necessary measures to protect their local market.

As a practical example, in one of the Arab countries, the invested capital cost per ton of annual production of pig iron reached \$500, a figure which is extremely high considered with the international standard of \$200. This reflects consequently on the production cost.

In another Arab country, a special Commodity Council was formed from representatives experts from different government enterprises concerned with iron and steel. This Council negotiates in the name of the local enterprises to secure their needs of imported raw materials, intermediate and finished products (if needed).

In addition to the above mentioned examples, other protective measures are exercised in different Arab countries.

In spite of the above precautions, there exist in some Arab countries free markets where steel commercial transactions are carried out without any governmental restrictions.

THE ROLE PLAYED BY THE DEVELOPED COUNTRIES ON
TRANSFER OF KNOW-HOW TECHNOLOGY - MANAGEMENT
AND TRAINING

Transfer of Know-how and Technology

- Transfer of technology is not a recent subject, but the technology and methodology of transfer are the elements calling the attention of developing countries.
- The concepts and terms in the field of transfer of technology are still unbounded. The Arab countries are in real need to the subject itself, and in particular in the transfer of the commercial know-how related to iron and steel processes, projects and operations which positively support their economical development. This may save them currently entering into complicated arguments of the know-why and know-how with its universal empirical and codifiable facts.
- An obvious strategy of industrialization in the Arab countries over the last thirty years was to stimulate the growing economical development through emphasis on heavy industry, particularly the steel industry.

Although the steel industry started in the Arab Republic of Egypt in 1947 on pure commercial basis, to match partially the local demand of reinforced steel bars, soon after that the strategy of change and development adopted new emphasis

on large-scale industries, and the establishment of integrated iron and steel plants was recognised by the governments of several Arab countries as an essential entry to economical development.

Integrated iron and steel plants were established and started production in 1958 in the Arab Republic of Egypt, in 1966 in the Republic of Tunisia, and in 1969 in the People Democratic Republic of Algeria

It is to be considered that, during the last 15 years, a suitable amount in the different kinds of know-how related to iron and steel has been gained by Arab experts.

Process Know-How, project know-how, and operation know-how gathered from the experience gained by tackling the economical, technological, and managerial problems distinctive to conditions prevailing in the Arab countries can be a real treasure of knowledge and know-how to developing countries and might be of value to the industrial countries.

The creation of native know-how beside the knowledge and common sense make the further receiving of technology and know-how easier and needs shorter time with more opportunities of success.

The possessed know-how and knowledge as a real background encouraged some of the Arab countries not only to adopt the

technology with some modifications, but also to manufacture locally many items for their plants to save foreign exchange.

- Developed industrialised countries are the creators of the modern technology. The process of transfer is inherent in the process of creation. At the same time, developed countries are the creators of the mechanisms of transfer. The inseparability of these aspects elucidate the role to be played by developed countries to the interest and advantage of developing countries. They are asked to take this role voluntarily, sincerely, and oriented to the problems of developing countries. Both developed and developing countries have to pave the way for successful transfer.

MANAGEMENT AND TRAINING

- The modern technologies used in the Arab iron and steel plants are mostly from West European countries and the Soviet-Union. The Arab responsible authorities, when contracting for their projects, considered not only matters relevant to manufacture, delivery of equipment, erection, testing, and putting into operation of the plant, but also the supervision of operations and training of natives.

In many cases the contracting technical management team furnishes technical management of the plant, including technical supervision of the operation, for a limited period.

Management techniques are recognised in the integrated iron and steel plants in developed countries as powerful tools which improve their efficiency and effectiveness.

In developing countries, and in most of the steel works in the Arab countries, managers may be tackling their problems in a detailed systematic way, but not necessarily using a management technique.

In this paper, we like to distinguish between a businessman and a manager. The businessman at the top of a company takes personally the financial and/or legal responsibility for the success or failure of the company. It is he who decides policy, the purpose and how to achieve it. Many of the businessman's decisions are moral decisions taken on the basis of personal feelings about how companies in general should behave.

A manager is a person paid to achieve the ends set for him by the businessman. It is the manager's task to give effect to policy decisions by deciding upon the most effective actions to achieve an objective. This is a rational process as opposed to a moral one.

The integrated iron and steel plants in the Arab world do not consider the profit as the most important performance indicator, although it is one of them.

In both Egypt and Algeria, the National merits obtained by possessing integrated iron and steel industry was the deciding factor that provoked the strategical decision of establishing their complexes.

- The importance of management is not looked over by the Arab authorities. Management institutes and administration training centres are created and actively contributing to raise management abilities.

Still, like anywhere in developing countries, the Arab steel industry is facing many management problems within the fields of production, planning, production control, cost control, budgeting control, personnel procedures, and so on.

In most of the cases the symptoms of the problems are clear, and the problems are defined or need be defined. Some of the problems are common to both developed and developing economies and some are relevant to the developing nation.

This suggests the necessity of directing a part of the activities of the inter-national and regional specialised organisations to organise managements clinics for iron and steel managers in developing countries. The application of modern management techniques and their effectiveness to the steel mills problem-solving should be the principal subject for such clinics.

- The iron and steel industry in the Arab country still carry the burden of improving and upgrading the skills and knowledge of their technical personnel to meet their specific needs. The industrial authorities, when contracting for a new steel mill, place special emphasis on the item of the In-plant training of the local personnel and normally tie it to the general conditions of the contract.
- The Arab countries possessing national planned economy are taking into account, when putting their economic development plans, to link the plans for industrial development with the needs of technicians on different levels and skills. Manpower planning on the macro level is receiving new attention of the Arab governments. Macro and micro training methods and facilities are absorbing a considerable effort of the specialised Arab organisations such as the Arab labour organisation and the industrial development centre for Arab States.
- The Board of the Industrial development center for Arab States has adopted a resolution in its 1st session in May 1969 and second session in December 1969 to implement a short-term work program to investigate the training potentialities in the Arab countries, in the following three key levels:
 - Personnel relevant to specialised management
 - Technicians
 - Practical trainers.

The Center issued, in September 1970, the 1st volume of the directory for industrial training programmes in the Arab countries. The directory gives details about the name, place, kind, duration, objectives, and other details concerning the age, qualification, language...etc. needed for participants. Though this volume does not contain programs related to iron and steel proper, it includes some programs for maintenance, preventive maintenance, electrical and mechanical technicians, industrial drawing and design, metal works, quality control methods, and organization and management, all of which can be of importance to any steel mill.

- . A specialized seminar will be organized by Idcas and the Arab Union for iron and steel to be held during 1974 for upgrading of trainers active in iron and steel training centers in the Arab countries. Idcas is orienting its activities in training towards the trainers who are supposed to carry out the training in their countries. This approach is expected to give optimal results.

Obviously, training of trainers is essential and pertains to the studies of manpower planning, description and analysis of jobs relative to need and policy, putting and implementing programmes and courses, improving training means and environment, and reviewing the training results.

- The first institute for training of trainers has been established jointly with I.L.O in 1962 and started its activity in 1964.

The institute is capable of training 1000 candidates yearly from Arab and African countries. It includes 50 engineers, teachers, and trainers as permanent staff assisted by some 30 specialised experts as part-timers from universities and higher institutes.

The present specialities covered are:

- Metal professions
fitting-jigs-turning-blacksmith-welding-metal working
- Automotive (Electrical and Mechanical)
- Electrical Engineering
general-motors-maintenance
- Electronics
Radio-television-operation and maintenance of electronic devices.
- Other industries like textiles, glass, leather.

The duration of the course is:

- 45 weeks (26 hr/week) per trainer
 - Advanced courses for 12 weeks (36 hr/week)
- The National Company for iron and steel (SNS) in Algeria has engaged about 4000 employees, workers, and technicians since its establishment in 1965 to start the first phase of El Hajar plant including one blast furnace.

The company took the responsibility to carry out a reliable training programme for 400 workers for production and maintenance and 100 technicians to be trained locally in Ennaba and 200 technicians and 180 engineers to be trained abroad. In spite of the regular effort, and the remarkable investment either for the manpower or for the different potentials related to it, training is still a problem not underestimated by the government as an important and controlling factor for the growth and success of iron and steel industry in Algeria. Beside the production objectives to be reached during 1973, it is anticipated to create about 8000 posts in the field of iron and steel, in the activities of production, maintenance, quality control, erection of new projects, organisation, and financial and industrial management and marketing. The nature of the problems confronted by Algerian iron and steel industry are the traditional problems met with by most of the developing countries that enter the fields of heavy industry to develop their economy. The most serious problem, was to provide the complex with 3500 trained technicians and workers, beside 1500 highly qualified persons trained to be engaged in key positions and capable of taking decisions. The available resources of education and training were unable to satisfy these requirements

at the time of operating the complex. The authorities were obliged to reorganise an adult training center in Ennaba so as to assist in taking part in solving the problem. The courses used at the beginning were alike those used in the adult training centers in France. Thereafter they were reconditioned and adapted to Algerian needs.

A second training center for technicians was established by (SNS) using the Russian technical assistance. It provides the plant with a part of its needs for specialists in production, manufacturing processes, and operations as well as mining specialists.

A third center, similar to that of Ennaba, has been established in Oran. Emphasis is being put now in selecting the candidates.

The training program carried out by SNS in the different fields of industrial and administrative activities is serious and potent. There is a special training department in the company that occupies an important position in the organization structure. Accordingly training schemes are implemented in the different levels and units of the company. Industrial relation and personnel problems are treated in one department that executes a defined policy to link promotion, wages, and engagement with training.

The short-term goals set by this policy are:

- a) meeting the needs for personnel required by the different units during the 4 years plan by engaging 7000 persons and securing their training.
- b) Raising the productivity of the present personnel to improve the production qualitatively and quantitatively.
- c) Preparing the necessary studies to develop further the policy of promoting the manpower in iron and steel industry.

. The iron and steel company at Helwan, in Egypt, planned to train its personnel since 1956. During the first phase, about 40 engineers and 60 foremen and operators were sent abroad for different periods. The majority of them were able to contribute in the last stages of erection and starting up the plant.

They were able to carry out intensive in-plant training programs together with the foreign experts present on site. Besides these training programs, many of the vocational and adult training centres supervised by the Ministry of Industry were able to provide the new-born industry with its needs from welders, electro and mechanical technicians, metal cutting and forming professions.

The need for metallurgists was obvious. The universities planned to fill this gap by opening, in their faculties of engineering, departments for metallurgy. The 1st department was opened in Cairo University in 1959, the second was opened in Assiut University (Mining), and the 3rd in the Institute for petroleum and Metallurgy in Shabin El Khayma. The three departments are capable of producing about 120 graduates a year.

- The extension plans of the Egyptian iron and steel plants includes the establishment of 1.7 million tons/year complex. Since signing the contract for this extension in 1968, the necessary measures to provide the complex with its manpower requisites were incepted.

The first phase to run the iron and steel complex requires about 8000 workers. In the second phase, the requirements are expected to increase to 12,000 workers, this in addition to the present manpower in the existing iron and steel works amounting to about 10,000.

The new complex includes the following projects.

- Investing the new mines at Baharia Oasis
- Investing new limestone quarries
- Establishing a new sintering plant and adding two new sintering units to the existing plant.

- Installing the third and fourth blast furnaces to increase pig iron production to 1.70 million tons/year.
- Installing an oxygen steel plant with 3/80 tons converters.
- The installation of a continuous steel casting machine for 1.5 million tons/year of steel billets.

The complex will be operated into two phases, the first in 1973 in which the production reaches 960,000 tons/year and the second in 1975 in which steel production reaches 1.5 million tons/year.

Studying the expected manpower needs emphasizes the importance of the middle technical class as an effective factor in implementing the development program.

Realising this fact, the policy tracers and planners have considered the execution of a reliable training plan geared to provide the expanding iron and steel industry with its requirements of technicians.

The plan aims at:

- Training of engineers and technicians in the Soviet Union, on modern equipments and design, for periods ranging from 6-9 months.
- Using a number of Soviet experts and trainers to participate in preparing training programs.

- Agreeing with the productivity and training department in the Ministry of Industry to improve and adapt its training courses to suit the needs of iron and steel industry.

- To coordinate the training programs carried out in the training centers with those of the production centers, three specialised training centers are established in the vicinity of the iron and steel complex. They are the metallurgical, the coke, and the electrical training centers.

Utilizing the present production units as on-job training centers.

**Engineers Needs for the Iron and Steel
Extensions in A.R.E.**

Specialization	Total No. Req.	To be Trained in			No training
		USSR	LOCAL INST	ON JOB	
Mechanical General	25	7	1	17	-
Mechanical Power	89	28	7	32	22
Mechanical Production	145	24	44	57	20
" Automotive	8	1	-	6	1
Electrical power	27	10	-	16	1
" Communic.	38	9	15	13	1
Metallurgical Eng.	60	17	17	21	5
Chemical Engineer	71	8	16	35	12
Civil Engineer	1	-	-	1	-
Engineering Economics	10	2	2	5	1
Total	474	106	102	203	63

**TECHNICIANS & TECHNICAL MANPOWER NEEDS FOR THE
IRON & STEEL EXTENSIONS IN A. R. E.**

Specialities	Total No. Req.	To be trained in			No Training
		USSR	Local Cent.	On Job	
Mech. Fitters....	2030	10	1249	251	520
Plumbing Pipe Fitters.....	205	10	92	19	84
Elect. Fitters...	153	4	57	30	62
Fine Instrum.....	30	4	12	4	10
Blacksmiths.....	78	3	42	22	11
Metal Casting....	158	12	81	57	8
Metal work & Steel Struc.....	49	-	24	13	12
General Elect....	59	-	13	25	21
Electr. (Power & trans.....)	194	13	91	43	47
Wireless, Teleph., Comm....	47	-	34	5	8
Air Cond. & Cooling	102	2	74	7	19
Mech. Pumps, Fans, motors.....	357	49	142	83	83
Carpenters	92	2	59	-	31
Refr. Brick Layer.	218	12	71	40	95
Crane Driver, & Mech.....	283	-	249	18	16
Sinter. Plant Operator	124	10	23	56	35

Contd.

Specialities	Total No. Req.	<u>To be trained in</u>			<u>No Training</u>
		<u>USSR</u>	<u>Local Cent.</u>	<u>On Job</u>	
Blast Fur. Operation.....	27	8	-	15	4
Steel Convert. Operator.....	132	34	42	41	15
Heating Furn. Operator.....	20	-	8	5	7
Rolling Mill Operator.....	40	-	-	12	28
Measurement & Meter. Test....	135	-	48	39	48
Mech. Drawing..	50	-	-	32	18
Welder.....	213	12	79	47	75
Metal Out. & Heat Treat.....	487	12	245	67	163
Electroplating & Tinning.....	18	-	-	4	14
Motor Car Repair & Maint.....	25	-	-	10	15
Others.....	75	-	-	8	67
	<u>5401</u>	<u>197</u>	<u>2735</u>	<u>953</u>	<u>1516</u>

. 4 .

**TRAINING INSTITUTES & TRAINING CENTRES
WHERE THE TRAINING PROGRAMS ARE BEING
CONDUCTED**

Category

Institute or Center

Top Management

- The National Institute for higher management
- The Arab Association for business administ.

Middle Management

- The National Center for Manage. Research
- The National Center for Industr. Safety

**Specialists in different
branches of technology**

- The National Research Center
- The Chemical Department
- The Atomic Power Organisation
- The Techno Metal Inst. for higher studies
- The Engineering Society
- Inst. for training of trainers.

Foremen and Skilled Labour

- Vocational training Center Complex, Helwan
- Metal training Center, Shubra
- 55 different training centers for variant training needs.

Semi Skilled Labour

- The training center of the General Railway Organisation.
- Different factories

Fellows Abroad

- The National Metallurgical Laboratories (India)
- UNIDO (in different places)
- L'Action (France)
- USSR (different places)

- 1 -

**INSTITUTIONS IN THE ARAB WORLD AND THE
ASSESSMENT OF THE ROLE PLAYED BY INTER-
NATIONAL COOPERATION TO REALISE THEIR
TARGETS**

- The United Nations Industrial Development Organisation (UNIDO) was established in 1966 as an autonomous body within the United Nations to promote and accelerate the industrialization of the developing countries.

In the Arab World, UNIDO plays a distinguished role to assist their existing institutions or to assist in establishing new ones.

- In Algeria, the main areas of UNIDO assistance have been the evaluation of industrial projects and the carrying out of feasibility studies for the development of new industries and the establishment of a Centre for Industrial and Technological Studies.

The purpose of the Center is to evaluate industrial feasibility studies and advise on projects to be carried out under the National industrial development programme.

Although this centre is not a specialized institute for iron and steel, it can undertake some studies in this field if required and with special arrangement.

- The Board of the Industrial Development Centre for Arab States (IDCA3), in its second session in November 1969, adopted a resolution to invite Arab States to establish national institutes specialised in industrial technology documentation, research, and design.

One of these institutes is specialised in iron and steel industry and aims at mobilizing the Arab efforts and avoiding duplication in a stage where all Arab states suffer from insufficiency in experts.

Besides, the Board envisaged these national institutes to be distributed among Arab countries to serve industrial needs in other Arab countries, whilst they render their services to National Industry. IDCAS, shall organise liaison between these institutes and all Arab countries.

The Board consented to the request of the government of the Democratic people republic of Algeria to establish the iron and steel institute in Algeria on national basis and to give regional services.

UNIDO AND IDCAS were both involved in the early planning and discussions as regards the establishment and functioning of the first step concerning the implementations of the documentation and information unit of the institute. Both organisations participated with the Algerian government to realise these steps. It is believed that this unit will be capable of providing information service towards the end of 1973.

It is anticipated that the Algerian government should submit a request to the United Nations Development Programme for the assistance required for the establishment of the specialised institute for iron and steel. But, due to the very potent current National development plan, and according to priority

considerations and the IP² for Algeria, it is postulated that the request for assistance will be postponed for some time.

- The Central Metallurgical Research and Development Institute in Arab Republic of Egypt was established in 1961.

The purpose of the institute is:

- to study the local raw materials and minerals and their metallurgical feasibility
- To recommend the establishment of the new metallurgical industries and study the economy of their production.
- Share in solving the metallurgical problems and in increasing the productivity and reducing the production cost of the existing plants.
- Proposing techniques for the use of the processes and techniques pertaining to recent development.
- Providing assistance and consultation in the evaluation and assessment of the industrial projects.
- providing the small industrial enterprises with the scientific services they require.
- Carry out training in the field of research and development
- Transfer of metallurgical knowledge

The institute comprises three main divisions. The first for ore beneficiation, the 2nd for general, physical, and industrial metallurgy, and the 3rd for the laboratories.

The present staff of the institute includes 72 researchers conferred the Doctor or M. Sc. degrees. More than 180 researches

conducted in the Institute have been published in international scientific journals, and 85 theses for M.Sc. and Doctor degrees were carried out under the supervision of the staff.

The Institute is endeavouring to increase its staff gradually till it reaches 150 researchers by 1980.

- Recognizing the importance of the role of the Central Metallurgical Research and Development Institute in A.R.E., the United Nations Development Program and UNIDO as executing agent have approved in June 1970 a project to assist the Institute and the plan of operation was signed in April 1971. UNDP contribution to the project is \$463700 against \$3.370.000 government contribution.
- In a second phase starting 1971, the Institute will establish pilot plants that link the research laboratories to industry. The UN contribution to this phase is expected to amount to \$1.85 millions. The site has been chosen adjacent to the iron and steel complex in Helwan, south Cairo. The pilot station includes demonstration units for ore beneficiation, production of ferrous and non-ferrous metals, alloys, refractories, casting, metal shaping and working, heat treatment, mechanical tests.
- It is worth mentioning that, besides the 180 researches already conducted, the Institute has registered four patents.

• In the ARE, a second institute for higher studies in Metallurgy has been established in 1968, aiming at:

- providing the ferrous and non-ferrous industries with qualified specialists graduated from the Universities.
- Carrying out scientific applied and laboratory research relevant to the problems of the iron and steel complex and other metallurgical enterprises, in order to arrive at basic solutions to develop, adapt, and improve the industrial processes and systems.
- Assisting in planning and programming to raise productivity.
- Developing the scientific notion of those working in the field of metallurgical industries by linking the industrial know-how in ARE with the recent development in developed countries.
- Providing consultations to local industries.

The institute includes ten specialised divisions for ferrous and non-ferrous metallurgy. They cover extraction, refining, foundry, metal forming, heat treatment, furnaces, design, control, automation, refractories, and planning and economy for the metallurgical industries.

The candidates of the institute are university graduates having two years practical experience in one of the branches of metallurgical industries. They are nominated by their companies

and attend condensed courses for two years, divided into four semesters, at the end of which they have to pass an examination. The last six months are considered a specialization phase during which the candidate studies one of the existing problems of the metal industries and submits a detailed project that suggests the solution or the alternatives to overcome it.

The institute started its activity in 1968.

In 1969 35 candidates joined the institute.

In 1970 43 " " " "

In 1971 110 " " " "

The institute can receive 200 candidates at a time.

The staff of the institute are highly qualified Egyptian and Russian experts and professors.

Practical training falls within the institute programme and is conducted in the local industrial enterprises as well as in the Soviet Union

Upon ending their studies, the candidates acquire a Diploma.

The committee for the Diploma examination is formed from professors from Moscow institute for steel and alloys together with professors from the Egyptian universities and Scientific Research Centers and managers and top executives engaged in the local metallurgical industry.

A pattern of the studies and consultations carried out by El-Tebin institute is mentioned to illustrate its contribution to the metallurgical industries:-

- Study on the non-metallic contents during continuous casting.
- Economy of gaseous reduction of iron ore.
- Factors affecting the mechanical properties of steel during rolling and how to improve the quality and reduce the rejects.
- The effect of heat treatment on brittleness of construction steels used for forged products.
- Study on the technology of melting the steel in the Egyptian Copper Company and the design of a new 50 ton SM plant.
- Remedying the technical defects of some steel alloys for El-Delta steel plant.
- Solving the problem of desulphurisation during melting of steel in electric furnaces in El-Delta Steel Plant.
- Operating problems of the blast furnaces in the Egyptian Iron and Steel Company.

Further, the institute has recently agreed with Moscow institute for steel and alloys to conduct high caliber scientific research on the direct reduction of the ores using metals in both laboratory and pilot scale.

Both the central metallurgical institute and the El-Tekin institute are good examples of two different types of international cooperation.

The two institutes are able to contribute positively to the research and consultation needs of the Arab World

- 1 -

SUGGESTIONS FOR THE PROMOTION OF MULTINATIONAL
COMPANIES IN THE ARAB WORLD AND THE
DIFFERENT FORMS OF COOPERATION
WITH INTERNATIONAL CONCERN

1. Cooperation in forming multinational investment for iron and steel is attractive and desirable to the many streams of its returns.
2. It is felt that a more active role should be undertaken by international, interregional, and regional organisations to seek for new approaches and improved techniques which can be considered as tools for policy makers and decision makers when studying such projects. As a unique technique may not work for all, it is felt that different effective techniques should be explored.

Anyhow, a dynamic model for a multi-national project will be evaluated and recognised on its merits and profit potentials to the partners and on its impact on their national economy and social benefits.

The second symposium for industrial development in Arab countries, held in Kuwait in October 1971, emphasized the importance and the interest of the Arab countries to give industrial Arab cooperation a more practical character by carrying out the following measures:

- The establishment of joint-venture Arab companies, the shareholders of them may be number of Arab countries and Arab organizations who are taking interest in the production of basics and intermediates and who are contributing to increase Arab

experts of industrial products; whilst fulfilling the local market with its needs of commodities, and particularly from capital-investment ones.

- Arab countries sharing the establishment of joint venture projects are invited to offer these projects financial, administrative and legislation facilities which guarantee them security and stability.
- The industrial development center for Arab states should submit the Arab countries with the studies carried out in this concern, and invites them to define their positions towards these projects during a predetermined period.

Countries and Arab organisations who are interested to participate in these projects should be invited to sign protocols and establish the implementing bodies.

The symposium has formed a follow up committee for the execution of its recommendations.

. The industrial development Center for Arab States has carried out a field study during 1970 on the possibilities of co-operation and harmonization of iron and steel industries amongst the Arab countries. The report prepared, based on field data, provides a useful reference work for further studies. It was obvious from the results obtained by analysing the figures and studying the facts that:

- a) The demand of the Arab market for steel products will reach about 8.6 million tons by the year 1980.

- b) The current expansion plans of existing plants are expected to cover 5.6 million tons of that demand.
- c) The natural resources of the Arab countries can contribute to a radical solution to cover a considerable part of this deficit of steel.
- d) The growing shortage of steel will continue increasing the drain of foreign exchange unless timely action is taken to establish a suitable steel producing capacity.

Early in 1972, IDCAC, co-operating with UNIDO, carried out a preliminary study for the establishment of an integrated steel plant of one million ton annual capacity based on gaseous reduction of iron ore in the Arabian Gulf or Mediterranean Area at Inter-Arab level.

The plant will utilize the rich deposits of natural gas spread in the Arab countries. The proposed process is either the HyL or any other successful commercially applied process which employs gaseous reduction. Regarding the iron-ore requirements, many alternatives exist. Arab deposits of high iron content, imported high-grade ores at low freight rates, or using of blends of local and imported ores are three alternatives; each of them has its own strategical and economical advantages.

Anyhow, the detailed techno-economic feasibility study will manifest the most advantageous alternative.

Since the proposed plant is going to be a joint venture

amongst a number of Arab countries and organizations, it is believed that its erection in a Free Zone will strengthen it and cause it to master flexibility.

After creating the Federation of the Arab Republics (Egypt, Libya, Syria) as a new political power, it was necessary to undertake the steps which might support this political existence through strengthening its economical base by perfecting, completing, and extending the economies of its three Republics.

The ministers of economy, planning, and finance in the three Republics considered the establishment of a number of joint projects as an applicable approach to bring together the resources towards unified economy. These should fulfill the following conditions:

- a) Can be implemented
- b) Contribute to the realization of higher rates of income.
- c) Bring together and amalgamate the economy of the three republics.
- d) Tie together their benefits and merits in a comprehensive programme of production.
- e) Has economical merits and socio-economic returns.

The priority has been given to industrial projects including iron and steel in consideration of:

- a) The ability of iron and steel projects to establish substantial support to economic perfection amongst the three republics.
- b) The iron and steel projects are a basic need of the republics of the Federation and is directly related to the investment of their natural resources and the development of most of their other economic sectors.
- c) Iron and steel projects will contribute to self-reliance in the economic development and the re-dressing and adjustment of the structure frame of Arab economy.
- d) Iron and steel projects are considered feasible to implement. They are also socially important and are considered a necessity for the Federation.
- e) The possibilities of implementation are existing. Amongst them are the raw material, technical skills, financial resources and profit, a fact that was difficult to realize within the limited economy of each individual republic.
- f) The execution of such projects is considered as possible as their implementation does not require an overall review of the development plans and the economic and financial policy of the member republics.

Accordingly, the Council of Presidents adopted a resolution to establish a number of strategic federal projects: amongst them is the Federal Arab Organisation for iron and steel.

Comprehensive studies including the different strategical, economic, technical and organisational elements for both short-term and long-term work plans are being considered.

- 5 -

**PLANNED PRODUCTION CAPACITIES AND
FORECASTED DEMAND FOR THE MAIN
STEEL PRODUCTS IN THE REPUBLICS
OF THE ARAB FEDERATION**

Steel Prod.	<u>1977</u>		<u>1982</u>		<u>1987</u>		<u>1992</u>	
	<u>Cap.</u>	<u>Demd.</u>	<u>Cap.</u>	<u>Demd.</u>	<u>Cap.</u>	<u>Demd.</u>	<u>Cap.</u>	<u>Demd.</u>
<u>Egypt</u>								
Raw Steel	2.17	2.17	3.3	3.3	4.5	4.5	6	6
R.C. Bars	0.8	0.75	1.2	0.99	1.5	1.2	1.8	1.5
Prof. & Flats	1.075	1.035	1.7	1.66	2.6	2.6	3.4	3.5
Sp. Steel (Rolled)	0.06	0.05	0.125	0.100	0.16	0.12	0.220	0.165
<u>Syria</u>								
Raw Steel	-	0.120	-	0.360	-	0.480	-	0.710
R.C. Bars	0.075	0.125	0.075	0.170	0.075	0.185	0.075	0.245
Prof. & Flats	-	0.180	0.235	0.285	0.335	0.435	0.535	0.605
Sp. Steel (Rolled)	-	0.010	-	0.015	-	-	-	0.03
<u>Libya</u>								
Raw Steel	0.500	0.350	1.2	0.410	1.2	0.700	1.8	1
R.C. Bars	0.050	0.050	-	0.070	-	0.095	-	0.120
Prof. & Flats	0.250	0.260	0.350	0.350	0.6	0.420	0.850	0.595
Sp. Steel (rolled)	-	0.010	-	0.010	-	0.015	-	0.025

COMMENTS

- A) The aforegiven table is an estimate of the future activities of the three Republics of Egypt, Syria, and Libya.
- b) The balance of the predicted capacities with the changes of Demand are shown in the following table in million tons.

	<u>1977</u>		<u>1982</u>		<u>1987</u>		<u>1992</u>	
	<u>Cap.</u>	<u>Demd.</u>	<u>Cap.</u>	<u>Demd.</u>	<u>Cap.</u>	<u>Demd.</u>	<u>Cap.</u>	<u>Demd.</u>
Raw Steel	2.670	2.640	4.500	4.070	5.700	5.680	7.800	7.710
R.C. Bars	0.925	0.925	1.370	1.335	1.575	1.480	1.875	1.885
Prof. & Flats	1.325	1.475	2.285	2.295	3.535	3.455	4.785	4.700
Sp. Steel	0.060	0.070	0.125	0.125	0.160	0.160	0.220	0.220

- c) Starting from 1977, a surplus in raw steel is expected. This surplus will reach its maximum of 30,000 tons in 1982 and its minimum of 20,000 tons in 1987. In 1977 and 1992 it is expected to reach 30,000 tons and 90,000 tons respectively.
- d) For R.C. bars, it is expected to have a balanced production/demand in 1977 followed by a surplus up to 1992.
- e) For profiles and flats, a shortage is expected (mainly in flats) up to 1982.

- f) The demand of special steels will balance with production starting from 1982.
- g) The production of raw steel will be concentrated in Egypt and Libya. In Egypt it is expected to be based on expansion of present complexes and steel mills as well as on the establishment of new complexes. For Libya, the steel production is correlated with natural gas, available in tremendous amounts. Under these conditions, the Libyan steel complex is being studied on the basis of producing sponge iron using one of the commercial direct reduction techniques.
- h) The Syrian share in the activity will be mainly focussed on the production of R.C.Bars.
- i) It is anticipated that the production of special steel will be concentrated in Egypt where it is expected to be mainly consumed.

As an exceedingly complex set of highly variable factors surrounds the previously mentioned plans, it can be considered only as a preliminary attempt based on available statistics and information.

The objective of the forecast is to provide an image that may help the establishment of a number of joint projects and adjusting the iron and steel economy in the three Republics.

(N.B.) It is expected that the Maghribian production from seamless tubes in 1985 (100,000 t.) will cover the majority of the Arab demand.

The General Arab Union for Iron and Steel established in April 1972 by a number of Arab organisations and companies in seven Arab countries and different commercial and production sections related to iron and steel, is becoming an active entity, playing an obvious role which is expected to contribute positively in co-ordinating and promoting Arab activities to develop their iron and steel industry.

Possibilities of co-operation between UNIDO-IDCAS, the Arab Union for iron and steel, and Le Centre d'Etudes Industrielles du Maghreb in developing Arab iron and steel industry are numerous. Amongst these possibilities is included the role that can be played by either each individual organisation or by two or more co-operating together as promoters to Arab joint venture projects.

The studies under consideration now are:

1. A comprehensive study about the strategy of cooperation in the iron and steel industry amongst Arab countries.
2. A detailed techno-economic feasibility study and preparing of the general specifications for an integrated one million ton steel plant, based on direct reduction.

(Proposed to be carried out jointly between IDCAS-UNIDO and the Arab Union for iron and steel).

3. A study about the most suitable form for Arab co-operation in the field of production of special steels and ferro-alloys.

(Proposed to be carried out jointly between IDCAS & UNIDO)

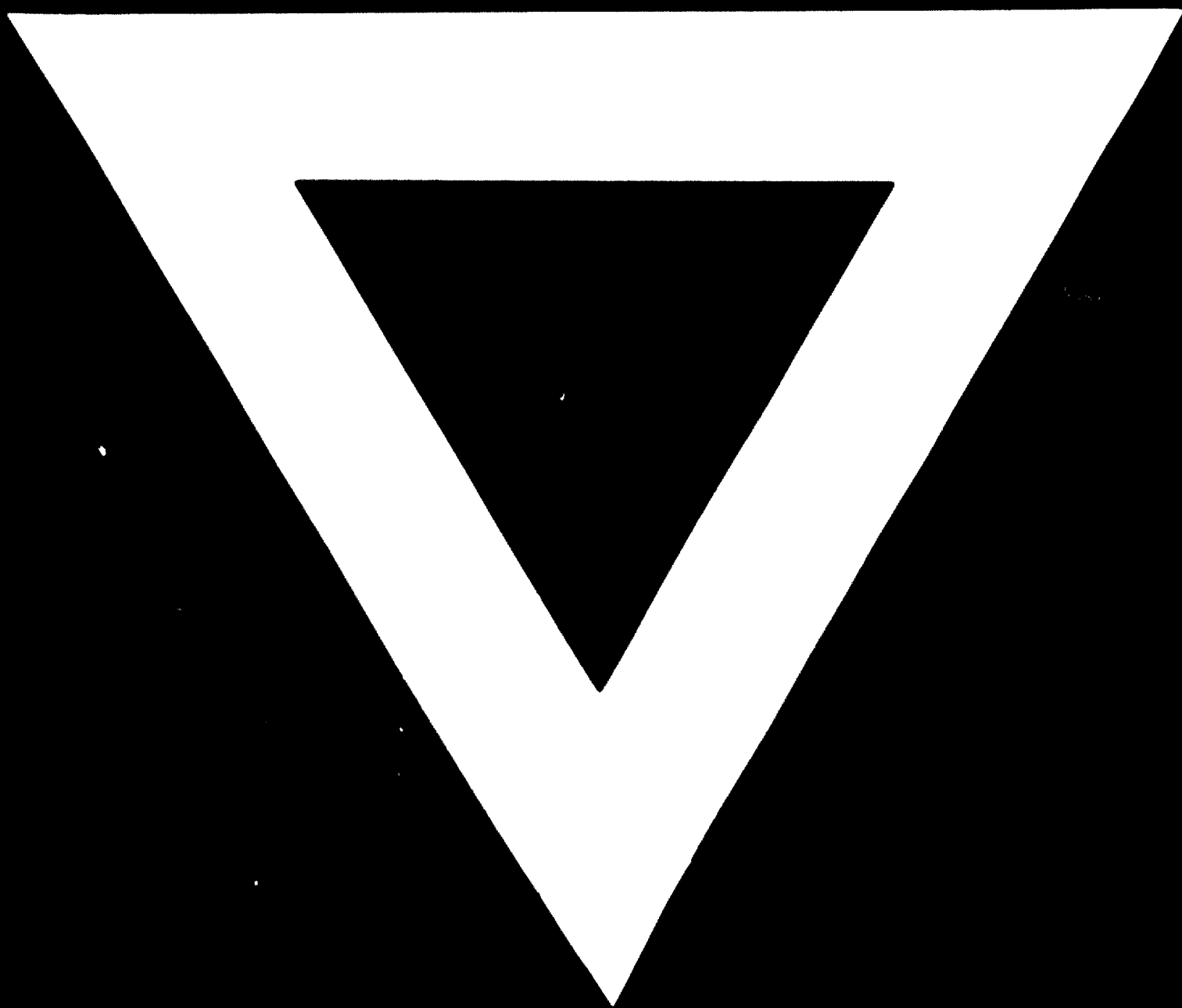
4. A re-investment study for the development of the iron and steel industries of the Arab Maghreb countries.

(Proposed to be carried out by the Union of iron and steel, Le Centre d'Etudes Industrielles du Maghreb, and UNIDO).

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