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UNITED NATIONS INDUSTRIAL
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INDUSTRY AND DEVELOPMENT

IN

THE UNITED ARAB EMIRATES

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Explanatory notes

References to dollars (\$) are to United States dollars, unless otherwise stated.

The monetary unit in United Arab Emirates is the Dirham (Dh). During the period covered by the report, the value of the Dirham in relation to the United States dollar was \$US 1 = Dh 3.90.

The term UAE denotes the State of United Arab Emirates or the Federal Government of the United Arab Emirates. The seven Emirates of the UAE are: Abu Dhabi (AD), Dubai (DB), Sharjah (SH), Ajman (AJ), Um al Quwain (UQ), Ras al Khaimah (RK) and Fujaira (FJ).

A slash between dates (e.g., 1970/71) indicates a crop year, financial year or academic year.

Use of a hyphen between dates (e.g., 1960-1965) indicates the full period involved, including the beginning and end years.

A full stop (.) is used to indicate decimals.

A comma (,) is used to distinguish thousands and millions.

The term "billion" signifies a thousand million.

References to "tons" are to metric tons, unless otherwise specified.

References to "gallons" are to British imperial gallons; one British imperial gallon equals 4.545 litres.

Besides the common abbreviations, symbols and terms, the following have been used in this study:

Economic and technical abbreviations

b/d	barrels per day
c.i.f.	cost, insurance and freight
DWT	deadweight tonnage
FCR	feed conversion ratio
f.o.b.	free on board
GDP	gross domestic product
GNP	gross national product
gpd	gallons per day
ha	hectare
ICOR	incremental capital output ratio
kW	kilowatt
kWh	kilowatt-hour

LNG	liquefied natural gas
LPG	liquefied petroleum gas
MEK	methyl-ethyl-ketone
mgd	million gallons per day
MW	megawatt
NA	not available
ND	not determined
NG	natural gas
PATF	Project Assistance Task Force
PE	polyethylene
ROI	internal rate of return
SBR	styrene-butadiene rubber
t/d	tons per day
TOE	tons oil equivalent
VA	value added

Organizations

ADNOC	Abu Dhabi National Oil Company
AID	Arab Industrialisation Organisation
CISD	Centre for Industrial Studies and Development
DIRD	Division of Industrial Regulation and Direction
FAIPA	Federal Agency for Industrial Promotion and Assistance
FIDB	Federal Industrial Data Bank
FIFO	Federal Industrial Financing Organisation
GOIC	Gulf Organisation of Industrial Consultancy
IBRD	International Bank of Reconstruction and Development
IDCAS	Industrial Development Centre of the Arab States
KNPC	Kuwait National Petroleum Company
UAE	United Arab Emirates
UAEDB	United Arab Emirates Development Bank
UNDP	United Nations Development Programme
UNIDO	United Nations Industrial Development Organization

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INTRODUCTION

1. The present study entitled "Industry and Development in the United Arab Emirates" covers a wide spectrum of industrialisation including projections of prospects, strategies and policies. The study is preceded by a similar exercise undertaken by UNIDO in 1974-1975.
2. Since 1974, the economy of the United Arab Emirates has gone through a transformation which could be qualitatively anticipated but its quantitative dimensions are difficult to comprehend with precision as the developments are both unconventional and overwhelming. The process of development generated in the recent years has produced some spectacular, some unsteady trends. The relative size of development is of an order compressed in a short time-span, which itself could lead to the recent trends. The government is rightly concerned about the socio-economic impacts, sometimes strains, that this development has generated.
3. With the completion of the first five years of the Federal Government, the country launched a new phase of development. The new development, not precisely articulated, seeks diversification of the economic structure and stability. The Government is considering the preparation of a national plan with a view to achieving an orderly and least costly development process. This needs to be supported by an in-depth, more dependable statistical base and identification of precise economic goals.
4. After taking cognisance of the discussions with the Government during the course of the study and the development of analysis, the original terms of reference may be represented as follows:
 - a) with a view to providing the perspective for industrial development, to appraise the dynamics of the economic trends in the recent past and to make broad projections over a medium term and a perspective span;

- b) to identify economic goals with special relevance to industrial development;
- c) to identify factor endowments contributing to and the availability of infrastructure for industrialisation;
- d) to appraise the present industrial structure and operations in the context of the recent trends and to locate the constraints on industrial development;
- e) to design a strategy of industrial development;
- f) to develop rational criteria for identification of industrial opportunities and to suggest, for in-depth studies, specific industrial projects;
- g) to recommend policy parameters and institutional framework to achieve the projected industrialisation goals, including directions and forms of international co-operation.

5. The study aims at the design of a strategy of industrial growth and the rationale for project selection. It does endeavour to identify specific industrial opportunities but these are more in the nature of project ideas illustrative of the rationale of project selection in pursuance of the industrial development strategy. The project ideas and their parameters will have to be subjected to comprehensive in-depth techno-economic feasibility studies. This applies specifically to the project sizes, which have direct relevance to the results of market surveys and technological packages to be selected.

6. The present study is the aggregate result of a multi-dimensional analysis and appraisal. It synthesizes the following results:

- a) a macro-level analysis and appraisal of the structural and operational dynamics;
- b) a field survey of the manufacturing sector conducted on a census basis for medium and large scale enterprises;
- c) economic and industrial projections including demand estimations over a wide spectrum of consumer and intermediate goods;
- d) sub-sectoral studies for review of the existing structure and industrial prospects in four distinct areas: petrochemicals, food products, building materials, basic metals and engineering;
- e) pre-investment data for identified industrial opportunities spelling out broadly the basic project characteristics and criteria.

7. A word of explanation on item b) would be in order since this was not included in the terms of reference of the Team. In the absence of dependable industrial statistics, industrial planning and programming cannot be accomplished; if accomplished, it would be misdirected. When the present exercise was launched, no industry-wide data were available on basic characteristics, such as investments, outputs, inputs, their values and sources, utility requirements, distributive channels, let alone on some vital coefficients, such as value added. To remove the data deficiency, a comprehensive industrial survey was conducted. The data flows, when fully available, will lay the basis for data development covering a series of vital indices and for in-depth research and appraisal of industrial structure and operations.

Acknowledgements

8. The team wishes to express its deep gratitude to H.E. the Minister of Planning, Mr. Saeed Ghobash for his personal interest, cooperation and direction and the excellent conditions of work and hospitality under which the Team functioned during its stay in UAE. It is through his good offices that the Team had the benefit of cooperation and assistance, not only of the entire organisation of the Ministry of Planning, specially H.E. Mr. Ahmed Mansour, Deputy Minister, Mr. Abdul Rahman Al Hadeed, Director General, Central Statistical Department, Mr. Ali Abdel Salam, Director of Planning and Mr. Hamida Bin Gasem, Economic Expert, but also of other Ministeries, Emirate Governments and a large number of organisations, distinguished officials, experts, businessmen and professionals.

9. The Team had the benefit of inspiration received from Mr. Abdul Rahman Khane, Executive Director, UNIDO, who paid a visit to Abu Dhabi during the Team's stay.

10. The Team would wish to place on record its deep sense of appreciation and gratitude to Mr. Faruq Achikzad, the UNDP Resident Representative in Abu Dhabi for his unqualified support and keen interest in the work of the project, without which it would not be possible to accomplish what is has. The Team had the most welcome

opportunity of having consultations with Mr. Sabah Kachichi, the UNDP Consultant. Thanks are also due to Mr. Abdulwahab, UNIDO's Senior Industrial Field Adviser, for his co-operation.

The team

11. The UNIDO Team was composed of the following experts:

<u>Name</u>	<u>Title</u>	<u>Duration of appointment</u>
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J. Bryrup	Building Materials Industries	
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S. Jowhari	Regional Industrial Development and Policy	
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12. Mr. R. Hammelton (UNIDO) provided valuable assistance and cooperation throughout the study, from its inception to final revision, which is greatly appreciated by the Team.

CONCLUSIONS AND RECOMMENDATIONS

Economic perspective and goals

1. Industrialisation is appraised as an effective and viable instrument in UAE for the achievement of the economic goal of diversification with stability and self reliance. Pursued with vigour and planning, the policy of industrialisation may secure, over a perspective period, say by the year 2000, a reduction in the dependence on the oil and gas extraction sector from about two-thirds to approximately one-third in terms of contributions to GDP.
2. The broad economic objective would call for an expansion of the manufacturing sector from a share of less than 2 per cent at present to approximately 20 per cent of the expanded GDP.
3. The dimensions envisaged, in the expansion of the industrial sector for the achievement of the identified goals, are large, almost staggering, when viewed from the point of view of the present status of the manufacturing sector. The magnitudes of the investments required to achieve such dimensions are even more staggering.
4. The realisation of the desired results will call for clear policy decisions in some outstanding areas:
 - a) the limits to which expatriate work force could be engaged;
 - b) a major re-organisation and strengthening of the Ministry dealing with industry;
 - c) the promulgation of an industrial law providing for a stream-lined industrial administration which would, among other things, prevent creation of surplus industrial capacities;
 - d) the mechanism for promotion of active participation of private enterprise in State sponsored projects;
 - e) a well-defined package of incentives and concessions for industrial investment;
 - f) re-vitalisation or creation of promotional institutions such as those involved in industrial development banking;
 - h) the precise role of and limits to foreign capital;
 - i) more substantive steps for specific and result-oriented regional and extended international cooperation which could prevent avoidable competition in international markets among the Gulf countries.

5. The UAE has already made the initial thrust towards industrialisation in its first phase of its spectacular economic growth during the 1970s. Having made a fairly thorough review of the resource endowments, potentials and capabilities, specially the investment capability, the UNDO Industrial Team is of the opinion that the indicative targets are attainable, practical and feasible in terms of socio-economic costs and benefits.
6. The UAE is placed more favourably than many other developing countries in the matter of certain resources and objective conditions for industrialisation. These include the generation of large capital surpluses and internationally tradable purchasing power, the freedom from social drags such as unemployment, a liberal and free economic policy not burdened with inhibitive taxation system and bureaucratic controls.
7. Some of the serious constraints on industrialisation of UAE, which generate the guidelines for industrialisation strategy are:
- a) a chronic shortage of manpower and skills;
 - b) an absence, outside the petroleum sector, of a wide range of material resources, which could serve as inputs to industry;
 - c) shortage of water resources;
 - d) relatively high cost of power despite the cheap and abundant source of energy;
 - e) an absence of industrial history and experience;
 - f) as a consequence of small population, a small size of domestic market despite high per capita incomes;
 - g) unavailability of a cadre of top-level management;
 - h) owing to the formative years of the Federal Government, difficulties in forging unified policies of development;
 - i) as a result of free trade policy without high customs tariffs, exposure of infant industries in UAE to severe competition from international sources;
 - j) despite the large capital resources of the country, the non-existence of broad-based risk-oriented capital market;
 - k) an absence of effective institutional base, an essential of an accelerated pace of industrialisation.
8. Each of these constraints has its own counteracting action centre, and the industrial strategy in UAE calls for a strategy which directly attacks specific action areas—and does not seek generalised, conventional solutions.

CONCLUSIONS AND RECOMMENDATIONS

Economic perspective and goals

1. Industrialisation is appraised as an effective and viable instrument in UAE for the achievement of the economic goal of diversification with stability and self-reliance. Pursued with vigour and planning, the policy of industrialisation may secure, over a perspective period, say by the year 2000, a reduction in dependence on the oil and gas extraction sector from about two-thirds to approximately one-third in terms of contributions to GDP.
2. The broad economic objective would call for an expansion of the manufacturing sector from a share of less than 10 per cent at present to approximately 20 per cent of the expanded GDP.
3. The dimensions envisaged, in the expansion of the industrial sector for the achievement of the identified goals, are large, almost staggering, when viewed from the point of view of the present status of the manufacturing sector. The magnitudes of the investments required to achieve such dimensions are even more staggering.
4. The realisation of the desired results will call for clear policy decisions in some outstanding areas:
 - a) the limits to which expatriate work force could be engaged;
 - b) a major re-organisation and strengthening of the Ministry dealing with industry;
 - c) the promulgation of an industrial law providing for a stream-lined industrial administration which would, among other things, prevent creation of surplus industrial capacities;
 - d) the mechanism for promotion of active participation of private enterprise in State sponsored projects;
 - e) a well-defined package of incentives and concessions for industrial investment;
 - f) re-vitalisation or creation of promotional institutions such as those involved in industrial development banking;
 - h) the precise role of and limits to foreign capital;
 - i) more substantive steps for specific and result-oriented regional and extended international cooperation which could prevent avoidable competition in international markets among the Gulf countries.

9. There has been a substantial expansion of population in the last 5 years of rapid economic growth, with a heavy inflow of immigrant work force. The future policy on immigration is yet to be determined, and the need for the spelling out of a more precise objective is clearly indicated. Indeed it ought to be recognized that industrialisation and the growth of population are correlated. The absence of definitive goals in the area may lead to misdirected development.

Existing industry

10. The gross value of output of the manufacturing industry expanded five-fold between 1972 and 1977. In the latter year, the value aggregated to over Dh 2,000 million. The product pattern is diversifying rapidly. Most of the industrial units established recently are equipped with modern and automated machinery. Some of the units are being managed efficiently.

11. Industry operates in an atmosphere of secrecy and, therefore, isolation. There is need for mutual sharing of information and experience, for collective action and for promotion of inter-linkages among industrial units.

12. Most industrial enterprises are promoted by impulsive motivations emerging from trading activities. They are not initiated by scientific studies. This has led to low capacity utilisation levels and shyness of industrial capital.

13. Institutional framework for operating industry is not standardised and regulated with the result that management practices are neither effective nor efficient. The industrial management ought to be professionalised.

14. The capital structure, in the absence of suitable institutional framework, is not broad-based. There is need for an appropriate mechanism that will promote a wider base for and easier transferability of industrial investments.

15. The industrial strategy in UAE has to be highly discriminating and selective in order to achieve optimal resource allocation. This does not imply that private enterprise has to be abandoned as the tool for achieving industrialisation goals. Private enterprises can be sustained in a semi-directed growth system which is positively supported by governmental assistance.

16. The direction the industrial sector receives does not have to take the form of decision-making by the State machinery. The process of direction can be evolved through a system of selective incentives and operative conditions. If, for example, industrialisation should not be promoted in a given geographical area because of national policy preferences, the absence in that area of infra-structure suitable for industrialisation would automatically prevent the emergence of industry in that area. Financing institutions may also accord preferential treatment to preferred industry groups in order to follow the selective strategy.

17. The recent occurrences in the construction industry should be taken as a valuable experience to prevent industry from suffering similar set-backs. This can be achieved by the introduction of a certain degree of discipline to industrial growth. It is necessary to avoid building up of excessive capacities by duplication of efforts.

18. There can be no doubt that UAE will have to seek the most modern and up-to-date technologies. Set against the basic and powerful need for such technologies, there are, nevertheless, a few significant constraints, to their adoption under local conditions, such as the small size of demand and shortages of manpower, skills and management expertise.

19. For supply of know-how, technology and management expertise, the industrialised countries are preferred sources. For supply of material resources, intermediate technology, management expertise and markets, the sister Gulf countries, Arab countries and Third World countries would provide the prospects for the desired collaboration.

20. The industrial project planner should distinguish between high capital costs of high level technology and the relative market prices for comparable technologies. This distinction will provide also the rationale for making the right choices regarding supply sources for plant and equipment.

21. Despite the dictates of policy preferences, it should be recognised by the planner that some industries would grow spontaneously as a result of favourable market factors and attractions. Bakeries must grow irrespective of economic logistics. A water bottling plant, even if the product cost is high, represents an industrial activity which needs to be promoted. Sewage treatment plant also belongs to this category, which is directed

mainly to a prudent and productive disposal of an effluent or prevention of environmental pollution.

Priority and selection criteria

22. The following criteria, besides high commercial profitability, should govern priorities to industries:

- a) the highest priority to industries which utilise local resources and can be viable on the basis of domestic demand;
- b) very high priority to industries which utilise local resources and have a high export potential;
- c) high priority to industries which are based on local resources and can be competitive internationally although there is no domestic demand;
- d) fairly high priority to industries which use local resources and have domestic demand but not large enough for an optimum plant but which can compete in the international markets;
- e) fairly high priority to industries which substitute imports at total cost (direct production cost and other social costs) much below import prices (c.i.f.);
- f) a very low priority to industries based on export and having a high component of a scarce resource, such as water, or of imported inputs without substantial domestically generated added value.

23. The foregoing priorities should be subject to capital and labour intensity criteria: higher priority to industries having high value added-capital ratio and valued added-manpower ratio.

24. Two projects are good cases to demonstrate the need for negative industrial policy: (a) mineral water bottling plant for export, (b) asbestos cement products plant. The former demonstrates the need for re-training projects which, lured by profits, seek to export scarce resources. The latter must receive serious attention since asbestos is considered a health hazard and there is a movement underway in western countries for banning its use.

25. While there is some scope for small and medium-sized consumer industries which will sustain themselves, the anticipated large dimensions of the industrial programme should be based on capital-intensive and relatively large projects.

26. The term capital intensive need not imply large capitalisation: it only means high capital-net output (or value added) ratio.

27. Small and medium-sized industrial units should be promoted as ancilliary or feeder activities, which will provide the industrial base and culture but these ought not to be allowed to distract limited manpower availability.

Infra-structure

28. Provision of infra-structural facilities must precede industrial activity. It may seem wasteful but it would be highly productive if the development of infra-structural facilities should be so geared that idle capacities in the infra-structure may be permitted with a certain time lag.

29. The supply of power to industry should be organised on a steady and low-cost basis and include the following:

- a) longer term planning should be introduced for power generation and distribution;
- b) consolidation of the capacities should be undertaken where necessary by discarding the old and inefficient generators;
- c) interconnecting networks should be developed on an inter-Emirate basis which can be evolved in stages.

30. The need for an in-depth power survey with particular reference to the needs of industry, is clearly indicated.

Industrial sub-sectors

31. Oil and gas, being the most plentifully available natural resource in UAE, oil refining, petro-chemical and energy-intensive industries shall be the mainstay of the future industrialisation programme.

32. It is obvious that the two major attacks in the direction should be the expansion of the refinery capacities and establishment of petro-chemical projects to the extent long-term marketing arrangement can be forged. In view of the fact that, in the short period, there is reportedly low utilisation of global capacities in the oil refining and most of the petro-chemical areas, effective steps in these directions shall have to be taken after very thorough market studies and international arrangements for marketing.

33. The potential, however, of the sub-sector would be available in spite of the presently estimated low capacity utilisation. The investment in global petro-chemical industry is expected to grow from US \$ 55 billion in 1980 to \$108 billion in 1985. The UAE must have its due share of the share of developing countries in the anticipated growth of world production.

The share is expected to grow by 1985 to 16 per cent in basic petro-chemicals, 20 per cent in plastics, 23 per cent in synthetic fibres and 13 per cent in synthetic rubbers.

34. In addition to the projects now under consideration, detailed techno-economic feasibility studies may be undertaken for production of carbon black, carbon disulphide, petroleum coke, lubeoil base stocks, graphite electrodes, automobile tyres.

35. In the refining and petro-chemical fields in particular, high-level expertise should be created for the evaluation and selection of product-ranges, technology, equipment, consultants, collaborators and marketing organisations. Consideration should be given for the establishment and implementation of a plan for intensive training of personnel in all functions of petro-chemical project development and operation.

36. There is a fairly good scope for development of building materials industries which satisfy high priority criteria, the existence of local demand and availability of local raw materials. The products preferred for manufacture will be those with (a) high specific weight, (b) low cost in relation to the weight, and (c) high waste or rejection factor in shipping. Light weight products with possible regional markets should receive high priority.

37. The labour intensive units, which have sprung up throughout UAE, should be discouraged and there should be intensive research on product improvement. Local building materials have given rise to low standard of building activity. The priority criteria should be re-oriented towards improved building technology. A building research institute should be established to co-ordinate and improve construction standards and to give direction to building materials industries. Among the industries which could be considered for immediate development include the manufacture of sulphur blocks (on which valuable work has been done by another UN Team in UAE; the manufacture will be based on a waste now being accumulated without application), light-weight concrete blocks, structural clay blocks, window glass and glass wool, gypsum plaster, mortar, blocks and panels.

38. Several food industries have been recommended for detailed feasibility studies and development. The selection of food industries was based mainly on locational criteria. Industries located in the raw material producing areas, major consumption centres, near super-market and hyper-market complexes, at port towns and those which can be promoted jointly

in one of the countries of the region or, on international basis, by establishment of joint projects in a country which could share material inputs, technology or markets have been selected.

39. In examining the potential for food industries, it should be ensured that industrialisation does not discourage consumption of fresh fruits and vegetables. Food industries based on exports which use water as a major input, should generally be discouraged since these involve indirectly the export of a scarce resource.

40. In the food industries sector in particular, action is called for a thorough micro-level study to determine imperfections in design and operational conditions, hygiene and health control, product qualities and potential for joint collaboration of projects in the region and other countries.

41. The food industries also require the establishment of institutions at the appropriate level:

- a) for development and co-ordination of industry, this will need participation of Ministries of Agriculture and Fisheries, Industry, Health and Planning;
- b) for uniform quality, hygiene and health control of production and marketing centres;
- c) for establishment and follow-up of codes, norms and standards;
- d) for promotion of exports in selected identified areas, such as marine products.

42. Because of the demand constraint and high labour utilisation factor, there is only a limited scope for establishment of basic metals, engineering, electrical goods and electronic industries. When the basic metal industries will be in production, there would be scope, however limited, of down-stream rolling, extrusion and fabrication facilities. The energy intensive areas in basic metals have been explored. An aluminium smelter is under construction; another is under contemplation. Consideration is being given to two sponge iron projects. These are steps in the right direction provided intensive advance planning has been ensured and necessary marketing arrangements concluded.

Industrial regulation and policy

43. The proposed industrial law, now under active consideration of the Government, may be re-examined to streamline the procedures and

to consider if necessary modifications are warranted to bring it in conformity with some of the leading conclusions and recommendations of the present study. The governmental machinery needs to be re-organised and strengthened if industrialisation is to play a pivotal role in the diversification process and if it is not to take the wrong directions.

44. The law should be supported by well defined industrial policy. Some form of industrial licensing, may be indicative type, is an imperative to prevent build-up of idle capacities, waste of resources and cut-throat competition within UAE industry. Industrial failures act as a powerful deterrent to favourable investment climate.

45. A positive method of directing industry in the desired directions would be to announce, at regular intervals, categorised lists of preferred, less preferred and not preferred industries, with degrees of preferences being based on identified national evaluation criteria.

46. Despite the local availability of capital resources, foreign capital, within defined limits, should be welcome to ensure free flow of high level technology and management expertise.

47. The essential parameters of policy on foreign investments should be spelt out and broadcast as widely as possible. These should include preferred and non-preferred sectors of industrial activities for purposes of foreign investments and the discipline such investments should observe.

48. The regulation should discourage inflow of foreign capital with majority voting rights and in directions which do not call for technological inputs, such as trading activities. When majority holdings of foreign investors are permitted, there should be a condition for the progressive dilution of their share above the standard limit, say 49 per cent.

49. Support and protection to industrialisation should be provided by provision of essential inputs on liberal subsidised terms but not through tariff protection.

50. Government involvement in industrial development should continue but an effort should be initiated to mobilise private savings and to canalise them into industrial activity. This needs a broad and stronger institutional base.

51. The proposed industrial law should incorporate provisions governing the formation of public and joint venture corporations for industrial projects.

These provisions should standardise the participation and transfer of investments from private sources. To facilitate and encourage participation by private investors in joint industrial projects, the public and joint corporations should follow standard accounting practices and their financial results and annual reports should be widely publicised.

52. With industrialisation gaining momentum to achieve the goals set for development, serious consideration should be given to the creation of a separate Ministry of Industry strengthened by the creation of the following divisions and institutional support:

- a) Centre for industrial studies and development;
- b) Division of industrial regulation and direction;
- c) Federal agency for industrial promotion and assistance;
- d) Project assistance task force;
- e) Federal industrial data bank.

Institutional framework

53. Project planning, evaluation and implementation are critical activities in the rational selection and realisation of industrial projects. While the task of project identification and execution has to remain the primary responsibility of respective industrial units, technical assistance covering functions other than evaluation should be organised by the proposed Ministry of Industry. The Ministry of Planning should create a division for project evaluation. The function of this division should include the development of national evaluation criteria and the guidance for the evaluation of projects in the larger economic context.

54. Guidelines should be developed for the industrial planner, the project programmer and the investment evaluator. These guidelines should not be considered as tools of controls for regulating economic activities, but as signals for directing industrial activities and as yardsticks which the evaluator/investor ought to use to make the right investment choices.

55. To prevent waste of resources and misdirection of industrial activity, larger industrial projects must satisfy minimum standards of national economic criteria in terms of capital/labour intensity (value added per unit of capital and labour). The value added should be computed on the basis of net national retention and by applying opportunity cost of capital (which is low) and of scarce resources which may be very high.

56. The industrial financing function at the UAE Development Bank should be made independent by the establishment of a Federal Industrial Finance Organisation, which should have large funds at its disposal. It should act as an agency for promotion of private industrial investments and should, by a differential interest rate system, encourage capital-intensive industries.

57. A properly regulated stock exchange is an imperative for rapid industrialisation based primarily on private enterprise and seeking to broad-base the industrial capital by mobilising the savings of the citizens and eligible foreign investors. However, a loosely organised institution may do incalculable harm to capital formation in industry.

58. A study should be undertaken to review the functioning of the Chambers of Commerce as catalytic agents for promotion of industrial programmes and of higher standards of industrial management. The proposed industrial law should consider assigning more authority and responsibility to these institutions. The operation of the Chambers may be subsidised to enable them to undertake common industrial studies, to promote management development and to upgrade technological capability of the industrial sector.

Management development

59. Training and manpower development in industry should concentrate on management development at all levels and specially in technical management. A management development institution should be established, to which the University, Chambers of Commerce and Government offices and institutions dealing with industrial planning and operations, should contribute their respective shares. Special encouragement should be devised for encouraging UAE nationals to undertake studies and training in management at pre-university, and university levels, both in UAE and abroad. The studies, training and other development programmes should cover major functional areas: general management, technical management, financial planning and control, market research and organisation, project planning and development.

60. A multi-tiered management development programme should be designed. Management education should be initiated at points lower than the University level and should include professional education and training by means of conventions, seminars, workshops, courses.

61. It is the feeling of the business community that there is a lack of information about the industrial potential of UAE, the State policies on the industrial sector, the role the private enterprise has to play and the incentives and concessions it can expect. Efforts should be organised on a continuing basis for dissemination of information. The work in this regard should be initiated by the preparation of an investors' guide for the benefit of both UAE investors and foreign collaborators.

62. When it is found necessary to promote industry under the auspices of the state at the Federal Government level, private participation both in investments and management, should be encouraged. This will call for streamlining of a standardised institutional base.

CHAPTER 1

THE ECONOMIC PERSPECTIVE, GOALS AND PROJECTIONS

Need for economic scenario

1.01 Industrialisation cannot be conceived rationally in any country as an isolated programme: it is an integral, essential part of national socio-economic development. In the absence of any definite indicators of future economic goals, strategies and targets, it is imperative that a broad economic scenario be developed if a meaningful industrialisation programme is to be promoted, a programme which is not lop-sided, wasteful of scarce resources and a distractive element in the development process.

1.02 An endeavour has been made in the present study — apparently it is not directly concerned with it — to design, however broadly and briefly, the broad indications of the economic picture over a period of two decades. This provides the perspective for the contents, design, strategy and policy framework for industrialisation.

Basic economic system

1.03 The political structure of the United Arab Emirates is federal in character with 7 more-than-autonomous units. But for the fact that the federal pattern is still in its early stages of formation and cohesive strength, it could be both an advantage and a disadvantage to the organic process of development. It is only necessary to evolve a mechanism by which the positive contributions may be maximised.

1.04 The federal structure imparts a much needed diversity. It should generate free thinking on policy formulation and institutional tools for the implementation of investment programmes. It may also act as a device for introducing checks to runaway growth.

1.05 It may, on the other hand, prove to be a serious brake to the growth mechanism. Policy formulation could be dilatory and it may not always be possible to pursue a uniform and integrated policy. This may explain, if only partially, why no short, medium or long term plan has so far been formulated, which, on an appraisal of the objective conditions of UAE, the present study finds to be a much-needed instrument.

1.06 UAE has a liberal, but distinctly its own economic system. The evolving federal political structure permeates the economic policy and institutions.

1.07 The present structure is the result of a rapid transformation of the economy during the 1970s. A basically traditional society has been acquiring a modern facade. In the three principal cities, Abu Dhabi, Dubai and Sharjah, a visitor witnesses little evidence of the old. This should not imply that the traditional values and standards are not respected. In fact, except for the consumption of products of modern industry, the family is, by and large, tradition-moored in Islamic values and standards.

1.08 Nonetheless, it is notable that almost complete new cities have emerged with multi-storeyed modern buildings and utilities. The workplaces as well present a modern look, whether it be factories or offices. With rapidly rising incomes, these developments have generated substantial demands (although not always adequate for optimal production levels), for manufactured goods. The demands are for sophisticated, high priced commodities.

1.09 The Emirates, which govern their own external trade, follow very liberal trade policies. With negligible import duties, re-export trade and the demand of a large number of expatriates (who, besides their own local consumption, carry back home internationally traded consumer goods, specially durables) have expanded phenomenally. The economic activities created by trade have, in turn, generated more demands for manufactured goods,

1.10 The city of Sharjah, or for that matter, the Emirate of Sharjah, is a good example of how, despite the small indigenous population, high incomes can create a cycle of compounding demand. The ratio of trade outlets (shops, stores) to local households (for whom all services exist) may be as high as 1:1. It may be a lesson in development policies for several countries which follow restrictive policies. It is a model in which demand generates demand; and the demand-induced demand generates further demand; development stimulates growth; and the induced growth generates further development.

1.11 The economic policies are Emirate-oriented. Pursuit of economic activities are freely allowed with practically no restraints. The nationals

are free — subject to what is mentioned later about Abu Dhabi — to establish any industrial venture, singly or jointly, with or without foreign participation. Immigration policy had been liberal; it is sought that it be restrictive in future. State assistance is extended in the form of allocation of land, free or at concessional rates. The power cost is high but in most areas, it is subsidised by the State. Imports of machinery and equipment, components and spare parts and raw materials are also freely permitted. There are no import or exchange controls. With freely convertible currency, both the investor and the consumer has direct access to world supply sources. This lends great competitive strength to the UAE buyer: he can buy the best; he can buy the cheapest. Whether, in fact, he does is a matter for investigation, specially in the case of capital goods.

1.12 There are no direct or indirect taxes: wealth or income tax, corporate or capital gains tax, value added, production or sales tax.

1.13 The freedom of the investor and the trader is, however, being increasingly moderated by the State and its agencies at both the Emirate and federal levels. The Emirate of Abu Dhabi has developed the framework of a Three Year Plan (1977-1979). The Emirate has already started a system of regulation for new industrial investments. The clearance has to be obtained before a new industrial venture can be started. There is an indirect control through industrial financing. Prices are being controlled in the case of some essential consumer goods to ensure fair prices to the consumer.

1.14 What is, however, more significant is the fact that the State has come forward as a major investor and participator in industrial activity.

1.15 In Abu Dhabi Emirate, the Department of Petroleum, in addition to the petroleum-based manufacturing activities of the Abu Dhabi National Oil Company (ADNOC), has launched several industrial ventures, some of which have been operating at full capacity. Others are in various stages of planning and implementation. More are being programmed and planned. In other Emirates, specially Dubai and Sharjah, the Rulers have taken active interest and sponsored, promoted and supported many industrial units. In Sharjah, a National Industrial Development Company, has, for example, been promoted to plan, launch implement and operate industrial projects.

1.16 All the Emirates have supported, actively and substantially, the industrial infra-structure. Industrial zones have been created with common facilities. Power plants have been established. Power and water are being supplied at a subsidised tariff. Water supplies are drawn either from underground sources or from desalination plants established at high capital costs. Ports have been developed with colossal investments and transportation services are being organised and supported. First class metalled roads have been developed.

1.17 Manpower development receives high priority. New educational institutions are being established. A University has been set up at Al Ain in the Emirate of Abu Dhabi. Vocational and training institutions are being created, while liberal scholarship programme is followed for UAE nationals desiring to study abroad.

1.18 The Federal Government has sponsored many measures for planning and regulation of the economic system. A comprehensive industrial law is actively under the consideration of the Government. So is a commercial law.

1.19 Increased co-ordination in the economic system is being proposed to be introduced through the system of integrated economic planning. The Ministry of Planning, the sponsor of the present study, is understood to be engaged in developing a plan. It is envisaged that the plan will be operative for the first half of the 1980s.

1.20 Despite the absence of a national economic plan, the very existence of the Ministry of Planning is a decisive indication of the desired direction. The Ministries of Economy and Commerce, Finance and Industry, Electricity and Water and Public Works and Housing, in particular, continue to play their respective roles in the process. There is increasing consultation, although not to the desired degree, among the Emirates.

Phases and characteristics of growth

1.21 The phases of development in UAE in the past and as should develop in future may be delineated as follows:

Till 1950	Traditional fragmented economic structure
1960s	Advent of oil
1970s	Oil bonanza and economic thrust
1980s	Consolidation with diversification
1990s	Balance with technological sophistication

1.22 In the early seventies, UAE attained the highest per capita income and accordingly earned the coveted distinction of being the richest country of the world. A basic problem of the classical models of developing economies was resolved. In the same breath, as it were, UAE has also attained another goal of development: full employment. It is, likewise, in the process of attaining the third characteristic of the developed world: high level of technological base as a direct consequence of deploying most sophisticated equipment in both 'production' and 'consumption' sectors. It is, therefore, not an easy question to answer: what does UAE seek to achieve by the so-called process of development? The concept of 'development' as conventionally understood, would seem to be a misnomer.

1.23 There has been a significant generation of economic activity to non-oil, less prosperous regions; but nonetheless, substantial disparities exist. Large parts of the Abu Dhabi and Dubai Emirates have also remained practically unaffected by higher levels of economic activity. The areas which have extracted the best advantage of the oil income inflows are those which are located around the more prosperous parts. This may, a priori imply that economic growth generated by the oil income gravitated to areas endowed with infra-structure, both physical and social. The latter is a powerful magnetic force attracting human settlements and consequential economic activity. To what extent the disparities can be reduced, is a matter largely of public policy.

Contradictions of development

1.24 The UAE economy presents an almost unique model for analysis to the industrial planner. In terms of per capita national income, UAE stands at record level and yet the economy calls for intensive development effort. This is in spite of the very high rates of real growth in term of income attained in recent years. Consumption standards are both high and low: high when compared to those in other developing countries; low in terms

of the GDP generated. Savings rates are abnormally high, but the size of capital formation leaves a large unused portion.

1.25 There is a wide gap not only between savings and investments but there is also between private consumption expenditure and disposable incomes and between total national expenditure (including for capital goods) and GDP.

1.26 The GDP and per capita incomes are high but absolute domestic demand is small from the point of view of optimum size of industrial capacity. While the domestic demands are small, the need for high level technology necessitates the establishment of large capacities. As a consequence of a brief industrial history, the absorptive capacity for high level technology and management expertise is not significant, but small size of the available work force and large doses of investments call for deployment of a high degree of technological intensification.

1.27 While the affluence of the country is directly related to a significantly large energy reserve, power is available to the manufacturing sector at high cost, because of the existence of small generating units.

1.28 The range and quantities of explored raw materials, outside the petroleum field, are too small to permit large scale capital investments.

1.29 Downstream projects, in the refining and petro-chemical areas in particular, as a result of technological considerations, have to be large. While the domestic demands are small in size, almost negligible in the context of resource availability, there has been, in recent years, a rapid expansion in industrial capacities in the world, a large part of which has remained unutilised. The potential for development in developing countries in some areas is restricted by the insulation of the international markets by multi-nationals with committed backward and forward linkages.

1.30 The domestic market is not only small, it is flooded with sophisticated, high quality goods from high-cost supply sources. While industry has yet to emerge, where it has emerged, it is in its infancy. No protection from international imports is available. The import duties on freely flowing foreign supplies are negligible.

Balance of trade

1.31 The favourable trade balance of UAE has not only grown phenomenally,

it is also large and leaves a surplus which provides a purchasing power and savings/investment capability that could generate a massive development. The following orders of magnitude will underscore the size:

	Favourable Trade Balance*/ (million Dh)	Index
1971	2,500	100
1972	3,000	120
1973	5,300	212
1974	22,500	900
1975	18,000	720
1976	22,000	880
1977	22,200	888

* Rounded upto 100 to highlight the magnitude.

1.32 Imports of UAE, which are a principal indicator of the size of demand, and accordingly, of potential for industrialisation, have grown at an abnormally fast rate. It is, however, realised that while the rate of increase in 1977 was maintained, there was a distinct deceleration in the second half of the year. The following table shows the rate of expansion of imports.

	Imports (million Dh)	Index
1971	1,469	100
1972	2,113	144
1973	3,279	223
1974	6,750	459
1975	10,571	719
1976	13,600	926
1977	18,200	1,239

1.33 Imports are received mainly through the two leading ports, Abu Dhabi and Dubai. In 1976, the last year for which confirmed and analytical data are available, the total imports were valued at Dh 13,600 million. The imports passing through Dubai were approximately 70 per cent of the total, with a value of little less than Dh 10,000 million. The share of Abu Dhabi exceeded Dh 4,000 million.

1.34 The respective shares in 1976, by quantum and value, were as follows:

	Quantum		Value	
	Thousand	%	Million	%
	tons		Dh	
Dubai	4,745	76.8	9,498	69.8
Abu Dhabi	1,431	23.2	4,102	30.2
Total	6,176	100.0	13,600	100.0

1.35 It is not without significance that the total value of imports of Dubai exceeded Dubai's oil revenues. It speaks of the importance of Dubai as a commercial centre.

Population

1.36 At the end of 1977, the total population was estimated at 862,000 which represented, as pointed out earlier, a phenomenal growth from 320,000 in 1972, only six years ago. This was due primarily to the influx of the immigrant work force intended to serve the needs of the fast expanding economy. In December 1977, the expatriate ratio had gone up to 74 per cent. In other words, for every UAE citizen, there were two expatriates.

1.37 The expansion in population generated by the high level of economic activity in the wake of 1973 world oil price changes, may be termed a population explosion. The UAE has been able to manage the population expansion in a manner which has limited its explosive character. Conscious now of the risks involved, the country should be able, in future as well, to maintain the same steady conditions. Discrete and cautious policy is needed and a balance should be found between the need to limit expatriate population and the requirements of development.

Financial sector and operations

1.38 The financial sector is headed by the UAE Currency Board. As of March 1977, the Board had foreign assets aggregating to some Dh 16,000 million. A little more than half of these were represented by foreign exchange and gold holdings.

1.39 In view of the growing importance of UAE as a commercial and financial centre, there is a large number of foreign banks operating in the country. At the end of 1977, there were 316 bank branches operating in

UAE. These belonged to 20 banks locally incorporated and 34 foreign banks. The largest number of operating branches was in Dubai (110) followed by Abu Dhabi (98) and Sharjah (54).

1.40 Money supply (including cash with banks) has been expanding very fast. Between December 1975 and March 1977, it was inflated from Dh 4,700 million to Dh 11,400 million or by about 2.4 times. This would represent one of the fastest growth rates of monetary expansion. Even the currency in circulation has been expanding rapidly. During the year 1977, when certain recessionary conditions were in evidence, the currency expanded from Dh 1,256 million to Dh 1,574 million representing in one year, a growth rate of 25 per cent.

1.41 The total bank credit to business and industrial enterprises expanded phenomenally between end-1974 and end-1977. The expansion was over four-fold between December 1974 and November 1977 as shown in the following table:

	<u>Million Dh</u>	<u>Index</u>
December 1974	780	100
November 1977	3,255	417

1.42 Contrary to the general feeling in business circles, there were no credit restrictions to business and industry even after the adoption of the restrictive policy announced by the UAE Currency Board in May 1977. The credit to business and industry continued to maintain an upward trend from month to month without a single interruption from December 1974 to November 1977 and shows the strength the industrial and commercial activity has assumed.

1.43 It was estimated that the inflation in UAE was of the order of 25 to 30 per cent in 1976 and 20 per cent in 1977. The UAE Currency Board has noted in its 1977 annual report that in recent years, "inflation has tended to become almost an in-built feature of the UAE economy".

Basic growth and structural indicators

1.44 In Table 1.01, selected economic growth and structural indicators are presented, covering: (a) population, (b) gross domestic product (GDP), (c) gross national product (GNP), (d) final consumption expenditure, (e) gross savings, (f) gross fixed capital formation. These lead to the following major conclusions:

TABLE 1.01

SELECTED ECONOMIC GROWTH INDICATORS

1972-1977

ECONOMIC INDICATOR		1972	1975	1976	1977*
(a)	A Population (thousands)	320	558	725	862
	B Index of A	100	175	227	270
(b)	C GDP at 1972 prices (million Dh)	6,436	12,120	14,584	NA
	D Index of C	100	188	227	NA
	E GDP at current prices (million Dh)	6,436	23,189	43,539	55,519
	F Index of E	100	526	677	301
	G Per capita GDP at current prices (Dh)	20,131	59,489	60,021	59,767
	H Index of G	100	296	298	297
(c)	I GNP at current prices (million Dh)	5,225	30,530	39,483	46,421
	J Index of I	100	584	756	888
(d)	K Private consumption (million Dh)	875	4,337	5,635	8,758
	L Index of K	100	532	691	1,075
	M Government consumption (million Dh)	859	3,581	4,836	5,813
	N Index of M	100	417	563	677
	O Total consumption	1,674	7,918	9,471	14,571
	P Index of O	100	473	566	870
	Q Private consumption as % of GDP	12.7	13.1	12.9	17.0
	R Government consumption as % of GDP	13.4	10.8	11.1	10.5
	S Total consumption % of GDP	26.0	23.9	21.8	26.3
	T Per capita private consumption (Dh)	2,552	7,767	7,767	10,160
(e)	U Gross Savings (million Dh)	3,552	22,613	29,012	31,351
	V Index of U	100	637	817	883
	W Savings as % of GNP	68	74	74	68
(f)	X Capital formation (Dh/man)	1,674	7,918	10,471	15,071
	Y Index of X	100	473	626	900
	Z Capital formation as % of GNP	26	24	24	27

* Provisional

Notes:

1. All data in the table are subject to revision.
2. The base year for index numbers is 1972.
3. Population includes expatriate population working in UAE.
4. Estimates are based on market prices.
5. Private and Government consumption means final consumption expenditure.
6. Capital formation means gross fixed capital formation
7. Except where indicated otherwise, monetary figures are at current prices.
8. GNP includes incomes of expatriates working in UAE .
9. Population at the end of the year.

Source: UAE Ministry of Planning.

- a) Between 1972 and 1976, the population had more than doubled. In the following year, it was approximating to a three-fold increase since 1972.
- b) GDP at constant prices */kept pace with population growth and the indices of population and GDP at 1972 prices had both reached a figure of 227 in 1976, the last year for which GDP data at constant prices are available.
- c) In the context of the enormously increased purchasing power generated by the rise in oil prices, which is the main contributor to GDP, the more relevant GDP figure is the one at current prices. The GDP at current prices increased eight-fold over a period of five years.
- d) Along with the phenomenal population increase, the expansion in per capita GDP has, to use a mild word, been substantial. It has pushed the country from a middle-income level group to almost the top level. However, the per capita GDP remained constant in the 1975-1977 period after having reached the highest level in 1974.
- e) Like the GDP at current prices, GNP also has expanded rapidly. The absolute amount of GNP in 1977 is estimated provisionally to be lower than GDP because of negative international income, but the growth of GNP at current prices has been both high and steady. The index with base 1972 being 100, has expanded to nearly 600 in 1975 and to over 750 in 1976 and was reaching the 900 mark in 1977. The higher rate of growth of GNP shows that net international income was becoming increasingly favourable to UAE.
- f) Consumption levels in absolute terms have expanded rapidly. At current prices, private consumption expanded by over 10 times. Government consumption expenditure has expanded but at a slightly slower rate. It increased nearly seven-fold.
- g) The ratio of private consumption level to GDP remained constant between 1972 to 1976 but in 1977, it rose to 17 per cent from 12.9 per cent in 1976.
- h) The ratio of government expenditure to GDP has declined from the base of 13.4 per cent in 1972 to around 10 to 11 per cent in the last three years.
- i) Per capita private consumption has grown in size from Dh 2,552 in 1972 to a little over Dh 10,160. This covers the total population including a large number of expatriate workers. The per capita consumption levels of the nationals of UAE are higher. Providing for inflation, the real growth rate would be much lower. Taking into account the rapid growth, on the one hand, and inflation, on the other, it may be concluded that consumption levels have grown four-fold. This is supported by a casual family budget enquiry.

* Deflators used are provisional and are not based on detailed market surveys.

- j) Gross savings are very high. The level in 1972 was estimated at 68 per cent of GDP, and it jumped to 74 in 1975 and 1976 but the provisional estimates of 1977 appear to bring it back to the base level.
- k) A large part of the savings is used as transfer payments abroad in the form of factor payments: aid, loans, investments, or accumulated as reserve.
- l) Capital formation has grown considerably in absolute terms along with GDP and inflation but, in relative terms, it has remained fairly constant. The ratio of capital formation to GDP was 26 per cent in 1972, 24 per cent in 1975 and 1976. The provisional estimates for 1977 bring it up to 27 per cent.
- m) The economy has been receiving massive doses of investments for development. The level of about Dh 1,700 million in 1972 jumped up to around Dh 8,000 million in 1975. It crossed the Dh 10,000 million mark in 1976 and reached the Dh 15,000 million milestone in 1977.

Projection of economic scenario (1975-2000)

Rationale of Projection Model

1.45 Based on the appraisal, analysis and strategy outlined in the report and considering in particular the goals and strategy of development with reference to the manufacturing sector, an attempt has been made to develop an economic scenario of the national economy during the quarter century, 1975 to 2000. It should, however, be noted that quantified objectives of growth rates or of the contribution of the manufacturing sector to GDP, in UAE projected in the present exercise are not officially endorsed by either the Government or the UAE or UNIDO. In fact, the projection model should be considered a tentative contribution of the Survey Team and the results are subject to further in-depth analysis and discussions among the policy-makers. It is only indicative in character and provides some substance to the design of strategy and policies for industrialisation.

1.46 The oil and gas sector contributes approximately two-thirds of the GDP with other sectors heavily dependant on it. A basic goal for economic development is a reduction in this dependence. To quantify this objective, a goal of reducing the share of oil sector to about one-third of the GDP may be considered a feasible and a prudent one to accomplish. Incidentally, all monetary values in the projection exercise are in terms of 1975 constant price level.

1.47 The model for projected growth takes into account, among other, the following major considerations:

- a) rapid growth rates in recent years;
- b) a pause experienced in some sectors and regions of the economy recently;
- c) the need to limit a substantial inflow of immigrant work force;
- d) the entry of UAE into exclusive club of highest income bracket countries in the world;
- e) the consumption and investment capabilities of the economy;
- f) the likely productivities that can be generated as a result of a greater capital and technological intensities;
- g) the need to keep pace with the development process without stagnation;
- h) the basic objective of diversification of the economy.

1.48 The following growth rates are considered viable and appropriate for GDP.

1975-1980	7.5%
1980s	5.0%
1990s	4.5%

1.49 The declining growth rates have been taken since the base would expand very rapidly and the growth, even at the reduced rates, will sustain a very high development level in absolute terms. The magnitude of growth above these rates can be increased only by straining the economy a little too much, requiring in the process large doses of investments and a high rate of increase in expatriate population.

1.50 The 4.5 per cent rate of growth is considered minimal for a developmental exercise since certain sectors must expand to be 'developed' by the introduction of higher technologies and the process of diversification leading to reduced dependence on one resource, namely, oil. This is necessary also to prevent diminution of the per capita income levels. With a 3.3 per cent growth rate of the organic (national) population, 4.5 per cent growth rate for the economy is the minimum level that the economy should try to achieve, which will yield an annual compound growth rate of 5.3 per cent over the analysis period. This will

be just 2 per cent higher than the organic population growth.

1.51 To pursue the policy of conservation of the precious oil resource and in the absence of any known long term policy over the perspective period, it is assumed that crude oil production will be pegged to 1977 level. It is imperative, however, that increasing quantities of natural gas be produced. The Emirates have already initiated ambitious plans in this regard. There will be increasing demand for natural gas from global markets with the depletion of oil resources in many oil producing countries for both power generation and expanding petro-chemical industry. A nominal growth rate of 1.25 per cent per annum has been assumed in the oil and gas sector^{*}. This rate will enable a steady redirection to be imparted to the sector by which the finite oil reserves are conserved and huge gas reserves, still to be used, are extracted at a faster rate.

1.52 References have been made in this report of the efforts being made by the Government to exploit the gas resources, both associated and non-associated. The Das Island and Jebel Dhanna LNG Plants would be reinforced in the future by similar projects. The reserves of the Bab field are considered to be possibly the largest in the Middle East. Under the Agreement with Japan finalised in 1976, UAE would export gas for 20 years at a cost of US \$6,000 million.

Expansion of the Manufacturing Sector

1.53 The principal instrument of diversification will be the manufacturing sector, and it must grow fairly rapidly. The Team believes that this is the view held by the Government. Illustratively, an official brochure, observes:

" In the past five years, vast sums of money have been invested in industrial development by the UAE Government. More than \$ 1,000 million is earmarked for the development of the petro-chemical industries alone during the next five years." " The quest for industrialisation is also one for diversification to widen the country's economic base to a range of industries and thus lessen dependence on crude oil exports as the major source of revenue. At the same time, the country's economic planners are aware that the oil reserves are not inexhaustible.....".

* Oil and gas sector in this report implies exploration, prospecting, extraction and mining of crude and gas. Refining and processing is covered by the manufacturing sector.

"The UAE's Industrial development programme reflects the international trend of shifting industrial capacity to the developing nations".

1.54 In a recent study by the Ministry of Planning in association with the International Bank of Reconstruction and Development (World Bank), it was provisionally estimated on the basis of projects completed and programmed that a growth rate of 34 per cent would be attained in the 1975-1980 period.

1.55 In the light of the conditions and constraints referred to in other sections of this report, it is proposed to take a downward deviation from the past trend and follow a course which is evaluated as viable and attainable at reasonable opportunity cost. This takes cognisance of the analysis of the opportunities for industrial investments made by the members of the UNIDO Team in their respective areas of specialisation.

1.56 Considering the identified factors including the magnitude of investments, manpower inputs required, factor endowments and other inputs of industry and the constraints of domestic and global markets, the following growth rates are charted for the manufacturing sector during the following five-year periods:

1980-1985	20.0%
1985-1990	15.0%
1990-1995	12.5%
1995-2000	10.0%

1.57 Considering a low base in the manufacturing in 1980 and a high growth rate achieved during the preceding five-year period, a growth rate of 20 per cent would be attainable, in the opinion of the Team, in the first half of 1980s. A 15 per cent growth rate for the subsequent period is fairly high when translated in absolute terms, and would be a more appropriate one. The growth process should attain a more normal course at 10 per cent towards the end of 1990s. To achieve that level, the growth would have to attain a steady trend. The magnitudes of investments required show that, as the manufacturing base grows, a 10 per cent is a more prudent expansion to plan for. Experience in many developing countries shows that a 10 per cent annual expansion in manufacturing output is a reasonable target and would be in conformity with the Lima Declaration and the New World Economic Order.

1.58 The rate of growth projected for the manufacturing sector and the aggregate economy will assign the manufacturing sector the task of contributing a share of approximately 20 per cent to the GDP in the year 2000. It has been argued that the diversification goal should endeavour to bring the share of the manufacturing sector to the level of the oil and gas sector. The possibilities of this objective were examined and it appears that within the time horizon of 2000, it is an unattainable goal unless the social and economic costs are permitted to rise very high.

1.59 On the contrary, the dimensions of the manufacturing sector, as represented by the data in the foregoing model, appear staggering. Even a brief review of the programmes commissioned, nearing completion, under construction, in the course of contracting and in advanced stages of planning, would dispel any doubt about these dimensions in the perspective of a quarter century.

Expansion of the Auxiliary Sectors

1.60 The growth of the manufacturing sector will obviously call for the expansion of other sectors. Since the present survey is intended for the manufacturing sector, only those sectors have been examined which are critical to it. The basic approach has been to allocate shares of GDP to the three sectors (construction, transport and communications, electricity and power) in 2000 which are consistent with the two leading and pivotal sectors. This has been accomplished by an evaluation of the existing structural pattern in UAE and by reference data on structural patterns of other comparable countries. These have been translated into monetary terms. The analysis has not been extended to intermediate years for other sectors since the essential elements of the scenario are already developed.

1.61 The economy would probably present the following picture:

	<u>1975</u>	<u>1980</u>	<u>2000</u>
	— percentage —		
Oil and Gas	71.9	61.2	31.1
Manufacturing	1.2	3.5	20.2
Non-oil non-manufacturing	26.8	35.2	48.7
of which			
a) construction	6.8	9.0	8.3

b)	electricity and water	0.7	2.1	7.3
c)	transport and communications	3.7	5.0	6.3
d)	others, including services	15.6	19.1	26.8

1.62 The monetary dimensions of the future structural pattern of the economy are presented in Table 1.02

Validity tests of the model

1.63 The present exercise may now be appraised by the application of basic tests of validity.

Manpower Capability and Productivity

1.64 In UAE the population growth is a function of the national growth of the UAE's own national population and of the policy on immigration which, in turn, is dependent on the assessed work force gap (defined as the estimated requirements minus the local work force). An exercise has been completed at the Ministry of Planning to envisage likely future growth of the population. These projections, only tentative and subject to basic policy decisions, are based on maxima and minima. For purposes of analysis in this report, mid-points have been taken.

1.65 The labour participation rate has expanded to 57.5 per cent. This is an abnormally high rate and with stabilisation in labour policy envisaged in the present study, there would be a steady reduction of participation rate. A 10 per cent reduction of the participation rate has been assumed by the year 2000. To the extent the participation rate is not diluted, this would represent a reserve upon which future growth can take place with reduced import of manpower.

1.66 On the basis of the enumerated factors, the growth in the population and work force is set out in Table 1.03.

1.67 The requirements of manpower, which are based on GDP projections and the estimated manpower productivity resulting from capital intensification, would be as follows:

	Gross value added (million Dh)	Productivity output per worker (thousand Dh)	Manpower requirements (thousand)
1975*	390	22.9	17
1980	1,085	35.5	47
1985	4,193	48.0	87
1990	8,433	60.5	139

* Base year

TABLE 1.02

BASIC MODEL OF ECONOMIC PROJECTIONS 1975-2000*
(million Dh)

S E C T O R	BASE YEAR 1975	ESTIMATE 1977	P R O J E C T I O N S				
			1980	1985	1990	1995	2000
1. Oil & Gas	23,963.7	28,197.0	29,267.7	31,143.2	33,138.9	35,262.5	37,522.2
2. Manufacturing	390.0	689.2	1,685.0	4,192.8	8,433.2	15,196.9	24,474.8
3. Non-oil non-manufacturing:-							
(a) Construction	2,278.0	3,651.5	4,308.3				10,108.6
(b) Electricity & Water	238.2	408.0	1,022.6				8,845.0
(c) Transport & communications	1,243.7	1,895.7	2,395.0				7,581.5
(d) Others, including services	5,206.7	7,492.0	9,157.0				32,473.9
Sub-totals (3)	8,966.6	13,447.2	16,882.9				59,009.0
Totals:	33,320.3	42,333.4	47,835.6	61,051.7	77,919.1	97,101.4	121,006.0

(GDP at factor cost)

* At 1975 constant prices

TABLE 1.03
PROJECTIONS OF POPULATION AND WORK FORCE

Y E A R	Population ('000)	Participation Rate * (%)	Employment Estimates ('000)
Census: 1975	588	53.1	296
Estimated: 1977	862	57.7	497
Projected: 1980	1,000	55.5	555
1985	1,400	53.5	749
1990	1,650	51.5	850
1995	1,950	49.5	965
2000	2,250	47.5	1,069

* Participation rate from 1980 to 2000 projected by the presented study.

Source: For population projections:
UAE Ministry of Planning.

1995	15,197	73.0	208
2000	24,475	85.0	288

1.68 Manpower productivity has been estimated to reach the normal level of Dh 85,000 in the terminal year. The 1975 industrial structure was constituted mainly of small establishments including tailoring shops and repair workshops and industries with low capacity utilisation levels. The strategy delineated in this exercise calls unequivocally for capital and technological intensification and concentration on large projects. In any event, a major part of the gross value added will be acquired from capital intensive projects. The target of Dh 85,000 per person is attainable. The growth of productivity has been projected on a linear basis. With a 20 per cent contribution to GDP, the industrial sector will need a total work force from around 238,000 to about 300,000 out of a total of over 1 million. Assuming only small increases in the manpower requirements of the oil sector, the other sectors should be able to manage with the residual work force. The improvement in labour productivity would occur by the upgrading of the primary and infra-structural sectors but mainly by the establishment of larger production units as well as the completion of projects undertaken in the earlier periods.

Investment capability and Incremental Capital Output Ratio

1.69 The investment capability test of the model is provided by the incremental capital output ratio (ICOR).

1.70 The ratio of investment to GDP was 24 per cent in 1975. It witnessed minor variations between 1972 and 1977. The figure for the last analysis year, 2000, is 26 per cent. It is considered that a 25 per cent investment absorptive capacity has been typical of the short-term recent economic development in UAE. It will gain momentum. Incidentally, the consumption - GDP ratios also have been low. It is the view of the Team that despite the expected increase in the consumption levels, enough surpluses would be available to enable the investment rate to grow to 35 per cent. A linear growth is assumed in the absence of any major change between 1975 and 2000, and rates will be as follows:

Investment Rate
Investment-GDP ratio

1975	24.0
1977	
1980	26.2
1985	28.4
1990	30.6
1995	32.8
2000	35.0

1.71 A time lag of two-and-a-half years is assumed between input and output flows. The ICORs are based on net investments after depreciation and obsolescence charge. Based on the foregoing analysis, the implicit incremental capital-output ratios are computed as follows:

<u>Developmental Phases</u>	<u>ICOR</u>
1980-1985	4.8:1
1985-1990	5.3:1
1990-1995	6.3:1
1995-2000	6.8:1

1.72 The increasing capital-output ratios will result from the use of developing technologies and the greater use of capital equipment in operations that currently use relatively large amounts of labour in relation to the factor endowments of the Emirates.

1.73 Projections to the year 2000 and recommendations on industrial strategy and investment projections in the present report may lead to the impression that there should be haste in regard to industrialisation. This is not intended. The development of industry should proceed in an orderly and cautious manner and criteria recommended in the survey, especially in regard to manpower and raw materials, should be adhered to. Caution is mentioned to avoid costly mistakes such as low profitability and the creation of excess capacity, which may not be utilised. Projects to be developed should be supported by sound feasibility studies and, in the case of export-oriented projects, full consideration must be given to conditions in the world market.

CHAPTER 2

RESOURCE BASE AND INFRA-STRUCTURE

Location and area

2.01 Of the total area of UAE of about 77,700 km², there is no Emirate outside Abu Dhabi which occupies more than 4,000 km², or 5 percent of the total area. Abu Dhabi alone accounts for approximately 87 per cent of the area. Distribution of area by Emirates is given below:

	<u>km²</u>	<u>%</u>
Abu Dhabi	67,340	86.67
Dubai	3,885	5.00
Sharjah	2,590	3.33
Ajman	259	0.33
Umm al Quwain	777	1.00
Ras al Khaimah	1,684	2.17
Al Fujeirah	1,165	1.50
TOTAL	<u>77,700</u>	<u>100.00</u>

2.02 The UAE occupies a very advantageous geographical location with easy access to sources of supplies and markets of Europe, Africa, the Middle East, South Asia and the Far East. With a long coast-line and all principal population conglomerations located on the coast, international transportation is relatively easy and not expensive.

Oil and gas

2.03 The proven crude oil reserves of UAE are placed at 30.5 billion barrels, equivalent of over 10 per cent of the reserves of all Arab countries. Of the UAE's reserves, 29.0 billion barrels are located in the Emirate of Abu Dhabi and 1.5 billion barrels in the Emirate of Dubai.

2.04 Of the total natural gas reserves of 343.9 trillion cubic feet of all Arab countries, UAE possesses 22.5 trillion cubic feet. The UAE's reserves of gas are shared by Abu Dhabi, Dubai and Sharjah in the proportion of 20:1.5:1.

2.05 The UAE's crude oil production and exports have been of the following order during the 1970s.

	Production (million barrels)	Exports (million barrels)	Deviation (million barrels)
<u>1966</u>	<u>131</u>	<u>132</u>	<u>- 1</u>
<u>1970</u>	<u>284</u>	<u>285</u>	<u>- 1</u>
1971	387	385	+ 2
1972	440	440	-
1973	556	553	+ 3
1974	612	608	+ 4
<u>1975</u>	<u>620</u>	<u>620</u>	<u>-</u>
1976	709	706	- 3
1977	719	711	+ 8

Sources: UAE Ministry of Planning, Central Statistical Department .
Annual Statistical Abstract, 1977.

UAE Ministry of Petroleum and Mineral Resources:
Oil Statistical Review, 1977.

2.06 Since the oil revenues depend on exports, for purposes of appraising the trend, exports may be taken as the more relevant characteristic. However, the divergence between the two series is negligible.

2.07 It would not be an exaggeration to say that for potential oil refining and down-stream petro-chemicals, the oil and natural gas resources in UAE are bountiful, if not unlimited. Besides the known reserves of the Emirates of Abu Dhabi and Dubai, there are indications that Sharjah has discovered large quantities of natural gas.

2.08 Off-shore associated gas, being processed since 1976 on Das Island to produce 2 million tons of LNG and 800,000 tons of LPG annually, is not available for domestic petro-chemical industry. It is being shipped under a 25-year contract to Japan. However, large quantities of feedstocks, 185,000 barrels/day of natural gas liquids, would be available in or about 1981 extracted from on-shore associated gas in the LNG plant under construction at Ruweis. Similar feedstocks would be available from the LNG plant under construction in Dubai.

2.09 The only operating refinery in UAE (at Umm al Nar) with a capacity of 15,000 barrels/day cannot offer feedstocks for a petro-

chemical industry. The 120,000 barrels/day refinery at Ruweis, now under construction and programmed to be operative in 1980, could offer substantial quantities of the required materials. This refinery is intended for domestic consumption .

2.10 A feasibility study has been commissioned for evaluating a refinery project in Ras al Khaimah. This, however, is reportedly based on crude to be imported from Kuwait and the products would, perhaps, find their way into the export markets.

2.11 The utilisation of associated gas is very low and large potential exists for its conversion into energy and down-stream products. This does not take into account even larger non-associated natural gas reserves. The natural gas production in 1976 was as follows:

	Million standard m ³
Abu Dhabi Petroleum Co.	325,611
Abu Dhabi Marine Areas Co.	158,433
Abu Dhabi (Japan) Oil Co.	5,384
Abu Al Bukush Oil Co.	13,182
Crescent Petroleum Co.	24,579

2.12 Sulphur supplies of some 230,000 tons/year, as a by-product of the existing LNG plant, are being generated now. The supplies are being accumulated. Additional supplies of 450,000 tons/year will be obtained when the new LNG plant becomes operative in 1980. It is estimated that from 1980, approximately one million tons of sulphur would be produced from the gas plants. With further processing of natural gas quantities, the flow of sulphur supplies may be very substantial with potential utilisation. A project for sulphur blocks as a building material is being envisaged.

Mineral resources

2.13 Limestone is available in rather big quantities in UAE. At the end of 1974, reserves were adjudged to exceed 200 million tons, making limestone a rather abundant raw material.

2.14 Sand of several types is available in UAE. The Colitic beach sands of Dubai and of the Abu Dhabi coast are both highly calcareous (more than 50 per cent CaO.) The quantities available, for all practical purposes, can be treated as unlimited. However, the silica content of UAE sands is not high enough to warrant the manufacture of high quality glass, but it is possibly adequate for the manufacture of coloured glass

bottles. Latest reports indicate that good silica sand has been found in Ras al Khaimah, suitable for production of glass. The deposits possess unique erosion-resistant quality of sand. The reserves are sufficient, according to the reports, for the entire requirements of the construction industry for a decade.

2.15 Marble deposits exist in substantial quantities in Ajman and Ras al Khaimah. A wide range of colours (possibly up to 40) are seen in the Masfout mountain range. Some of the varieties seem to have qualities and characteristics of the better type of Italian marble.

2.16 Gypsum, in considerable quantities, but lacking in purity, exists in several parts of UAE. According to available geological information, the Emirate of Abu Dhabi could possibly locate beds of pure gypsum near Jebel Hafit and in the western and eastern parts of Jebel Al Ain. It is understood that Dubai has some usable deposits in Jebel Ali. The "Sabkah" formations of Ras al Khaimah also have impure type of gypsum. According to one study, an examination of one of the geologic drilling logs in Abu Dhabi revealed several beds of white, hard, primary gypsum that are up to 15 metres thick and are situated at depths of less than 65 metres. Some of these gypsum beds contain thin bands of limestone or marl, but it is possible to locate beds of pure gypsum up to five metres in thickness.

2.17 Common clay, when available in adequate quantities and appropriate qualities, is the cheapest building material for use in red brick. UAE has a few isolated deposits of impure clay such as dry, blue-green clay in the Al Ain area in the Emirate of Abu Dhabi but good clay has yet to be found.

2.18 In 1975, Hunting Geology and Geophysics Ltd. undertook a mineral survey of the northern Emirates. The following, among other, conclusions were made:

- deposits of gypsum look promising and consideration of the export potential is recommended; and
- for making red bricks pilot plant, experiments should be carried out as none of the materials available is ideally suited for the manufacture of this product.

2.19 However, shale could be an excellent raw material for burnt clay products.

2.20 The Ministry of Housing and Town Planning proposed in August 1976 an investigation of construction materials in the Northern Emirates. The proposal specifies sand and gravel, clays and shales, gypsum, asbestos, minerals for rockwool and lime. This investigation is now under way under the auspices of the Ministry of Petroleum and Mineral Resources.

2.21 In March 1976, the Ministry of Housing and Town Planning commissioned a study for the present sources of aggregates used in the Emirates. With the cooperation of a United Nations Mission, a general survey was made to locate them, test their physico-chemical properties and to propose new sources of suitable aggregates. The study indicated the need for a more comprehensive survey for new sources of aggregates in the Emirate of Abu Dhabi.

2.22 For purposes of concrete for the construction industry, there are the two choices: either to locate the acceptable raw materials or to produce sulphur resistant types III and V of cement. Efforts are being made in both directions.

Agriculture and allied resources

2.23 In the four agricultural regions, the total number of holdings is less than 8,000. These are distributed regionally as follows: northern 454, southern 2,205, central 2,305 and eastern 2,528. Of these, 44 are controlled by companies and 238 by governments.

2.24 The agricultural raw materials which are available for utilisation in food industries in the near future are limited; and those for non-food industries are practically non-existent. The terrain and the climate in UAE does not encourage agriculture, nonetheless, as a result of substantial capital and effort invested by the Government, there has been some progress.

2.25 The most important obstacle to agricultural development is, no doubt, the lack of water resources and poor irrigation systems. In the recent years, migration of the working force has emerged as a major problem. In UAE the total cultivated area is a little over 15,000 ha constituting less than only a fraction of two per cent of the total area. It is estimated that about the same area of cultivable land will be available for expansion.

- 2.26 The Emirate of Abu Dhabi has set a target to attain self-sufficiency in agricultural production. Al Ain and Sadiyat have been developed as intensive agricultural areas.
- 2.27 At Al Ain oasis, about 60 per cent of the cultivable areas is occupied by date palms. Other fruits grown there, although on a small scale, include citrus fruits, figs, mangoes, bananas, guavas, papayas, grapes and oilives.
- 2.28 The Arid Lands Research Centre was set up by the Abu Dhabi Government in 1967. It aims to make maximum use of the three common natural resources in the area, sand, sea and sunlight. The Centre now has five acres of glass or polythene houses in which are grown about 360 tons of fruit and vegetables per year. This system of growing crops in a desert has been very successful and supplies local markets with vegetables such as tomatoes, cucumbers, pepper, cabbages, beans, broccoli, spinach, lettuce, radishes. Very high yields have been obtained in the experimental farms.
- 2.29 Another area where agriculture is practised is the Buraimi oasis divided between Abu Dhabi and the Sultanate of Oman. There is also agriculture in Liwa oasis in the interior of Abu Dhabi.
- 2.30 A project in Ajman is the Gogoba tree development scheme developed by the University of Arizona Arid Land Research Centre. The seeds of the tree give a type of vegetable oil suitable for use in the production of cosmetics, pharmaceuticals and lubricants. Gogoba leaves provide valuable animal nutrition and could be used in livestock development.
- 2.31 A prospective center of agriculture in UAE is at Fujairah, where production has increased considerably during the past few years. Hydrological and soil surveys have been carried out in this area and large new areas have been brought under cultivation. Agriculture is practised in the mountain valleys and the coastal plains of Fujairah.
- 2.32 In Fujairah Emirate, as well, about 60 per cent of the cultivated area is occupied by date palm trees. Other fruits grown, although on a small scale, include mangos, citrus fruits, (limes, lemons), guavas and bananas.

2.33 Ras al Khaimah, the traditional market garden for the lower Gulf States during the winter months, produces considerable fruit and vegetable crops. Plentiful underground water supplies come from the neighbouring Omani mountains and the rainfall is heavier than in other Emirates. Approximately 15 per cent of Ras al Khaimah's territory is under cultivation.

2.34 Besides Digdaga Research Station, there are several private farms which produce both summer and winter vegetables for the markets of Dubai and other towns along the coast.

2.35 There is, relatively speaking, considerable agricultural activity in Sharjah, centered around the oasis town, Al Dhaid. About 50 km from the main town, Al Dhaid, fertile lands, produce not only dates but also bananas, lemons, oranges and some vegetables.

2.36 In the eastern region of the Emirates, there are extensive date gardens at Khor Fakkan and Kalba. At Kalba, there is an agriculture station experimenting with fertilizers, insecticides and new methods of overhead irrigation.

2.37 In six of the Emirates, other than Abu Dhabi, about 75 per cent of the cultivable area is planted with fruits, of which 90 per cent are date palms. Other fruits grown include mangos, citrus fruits (limes, grapefruits and oranges), figs, guavas, pomegranates and bananas. Alfalfa and some other crops are interplanted between fruit trees.

2.38 Apparently, there was an estimated surplus of about 25,000 tons of dates in 1977. The country has produced in that year about 1,950 tons of mangoes.

2.39 The UAE markets are normally flooded with tomatoes at low prices during the peak season. Some experts have estimated that quantities could be sufficient for establishing a tomato processing unit on an economic basis. However, the demand for rapidly increasing population should be considered. There have been some imports in recent years. It is possible that tomato season be prolonged through planting early and late varieties, and the yield could be increased by protective green houses. With increased production, processing facilities could be established. The same applies to potatoes and other vegetable products.

2.40 In association with UNDP, a Food and Agriculture Organisation (FAO) project is operational, the objects of which cover, among others, investigation of water requirements in UAE for fruit and vegetable crops, quantities and depths of underground water, and the traces and trends of soil salinity under different irrigation programmes. The FAO programmes cover other functions, such as evaluation of the furrow, sprinkler and drip irrigation systems, identification of fertilizer responses and management of the calcareous sandy soils, testing and identification of the farm equipment best suited to mechanised farming in the country, and development of research data on optimal soil and water use.

Water resources

2.41 The country has no all-year round surface water whatever, but does have a number of wadis and natural springs. Water resource surveys are not presently optimistic about the availability of enough water supply of the proper quantity for both agricultural areas. Scarcity of rainfall and an extremely high evaporation rate, specially during summer months, further aggravate the water problem.

2.42 In Ras al Khaimah, water is available in acceptable quantities in winter from the Oman mountains and also from underground sources which are the main sources for agriculture and food industries in that Emirate.

2.43 There are optimistic indications of potentials for underground water in Fujeirah, Sharjah (Al Dhaid) and Umm al Quwain, but these are still in the investigation stage.

2.44 The Ministry of Electricity and Water has undertaken several water projects including wells in Ras al Khaimah, Sharjah and Umm al Quwain.

2.45 Desalination, despite its cost, is to be used on a much larger scale as a means of increasing water supply without damaging natural reserves further. Over the past several years, nuclear desalination studies and industry experience have drawn attention to the scale of economics of sea water evaporator costs and to the economic advantages of combining fresh sweet water and power production in a single system.

2.46 It is increasingly maintained that with improved irrigation techniques and methods of cultivation, the yields of agricultural production can be improved appreciably. A third of the world's land is dry and virtually unoccupied, while half of the world's people are jammed in impoverished and undernourished tenth of the world land area. If the sweet water and power needs can be met, the warm dry areas of the world (such as those of the Arabian Peninsula, including UAE) may be more appealing for human occupancy than the rain forests or the frozen tundras. Since much arid land lies relatively near the sea, desalination has good potential applicability as a source of sweet water.

2.47 It is of interest to explore the feasibility of bringing new acreage in the coastal deserts into intensive cultivation via nuclear desalination and irrigation by generation of additional power through what is termed as nuclear-based agro-industrial complexes.

2.48 In general, the crop pattern problem for nuclear desalination farming would appear to stimulate and focus on agricultural research, including experimental stations in arid regions where the assembling and demonstration of the total systems can be carried out.

2.49 If the concept is found feasible, UAE may, in the same breath, resolve, a number of problems of development, of water supply, of agricultural development, of food supplies for the domestic and regional markets and of the management of the arid desert areas. The issues or constraints that emerge are: (a) fossil fuel-rich country exploring for nuclear energy, (b) availability of technological base, and (c) the supply of manpower for agricultural and other areas of development.

2.50 It may be found worthwhile to initiate some efforts in this direction through UNIDO. This may, in fact, open up an unconventional area of mutual corporation between four states: UAE, Saudi Arabia, Qatar and Oman.

Livestock

2.51 At present, UAE imports nearly all its meat requirements. It is possible, however, that the country replaces some imports by locally produced animals. There were 405,000 heads of sheep, goats,

camels and cows in 1977 which produced 23,000 tons of various animal food products.

2.52 Research in livestock breeding is in progress in Ras al Khaimah and some other Emirates. Digdaga Dairy Farm includes a livestock farm, where imported stock are cross-bred with local ones.

2.53 Umm al Quwain and Dubai animal farms have imported meat cows and lambs. By setting up modern programmes of cross-breeding of local cows with suitable European bulls, following strict schedules for animal-feeding, introducing well-balanced and adequate animal-feeds and proper sanitation practices, UAE can expect to reach its desired objective of creating a new generation of high quality and high yield cattle for milk and meat. This is a realisable goal but existing output levels do not provide an adequate basis for industrial development of domestic milk and meat.

2.54 Ras al Khaimah has a modern dairy farm at Digdaga. It has Friesian milch cows which gave about 150 tons of milk in 1977, 60 cattle for meat (also Friesian) and about 500 heads of sheep. It is understood that the number of milch cows will be increased to 1,000. Al Ain will soon have a modern farm raising 1,000 heads of cows, with the objective of producing 2.5 million litres of milk.

2.55 There are some poultry farms now in operation (Falaj Al-Mulla, Ras al Khaimah); some are under development along Al Ain Abu Dhabi highway; and others are under consideration (Dubai and Ajman). UAE is planning to have in the near future, a production of about 15 million fowls. The aggregate imports of poultry via ports of Abu Dhabi and Dubai in 1976 were 21,778,000 kg valued at Dh 104,940,000. The imports of eggs in the same year were of the order of 9,000,000 kg.

Marine resources

2.56 Fishing is traditional industry along the east and west coasts of the UAE and surveys carried out by FAO indicate that the UAE off-shore waters offer rich rewards. The Government is taking steps to train fishermen in modern methods and to introduce up-to-date equipment. Small ports are being built around the coast and communications are being improved to facilitate the distribution of fish to all parts of the country. Fishing is the major occupation in the two smaller Emirates,

Ajman and Umm al Quwain.

2.57 Although fishing has always provided a means of livelihood to a large segment of the population in the northern Emirates, the potential was not fully investigated until recent years.

2.58 The Gulf of Oman, on which Fujeriah and the eastern enclaves of Sharjah are located, is known to have some of the richest fisheries in the world. A survey which is now under way, will indicate if there is a potential for production of a million tons of fish a year on the coastal regions. The present production is estimated at 64,000 tons a year. Studies conducted by two Japanese experts of the coastal inlets of UAE have affirmed that there are good prospects for developing fisheries.

2.59 Estimates of the unexploited potential of the two Gulf coasts vary largely from one report to another. Estimates of the potential in fisheries range from a modest figure of 150,000 tons of fish (demersal or pelagic) per year to the more optimistic figures of 450,000 to 600,000 tons and going as high as 1,000,000 tons.

2.60 Nearly all references available concentrated mainly on a limited range of species of fish, shrimp, crayfish (lobsters) and pearly oysters. The resource survey should cover other valuable species, such as sharks, crabs, fish eels, oysters and clams, sea turtle and sponge.

2.61 The projects now under way should attempt to co-ordinate activity for all seafood resources in UAE. The programmes should include development of fishery techniques, fish breeding and education of workers employed in marine activities concerning fishing.

Electric power

2.62 The UAE has ample resources for the generation of low cost electric power. Natural gas can be used to generate electricity in most part of the country at low costs.

2.63 In Abu Dhabi in mid-1978, the total installed generating capacity was 680 MW. Six steam turbines, each of 64.5 MW, are under construction in Umm al Nar, which are expected to be commissioned in 1979 and 1980. Several small generating units are operating in isolated areas with a total installed capacity of about 30 MW.

2.64 An underground 132 kV cable ring is operating, connecting major sub-stations at Abu Dhabi city and supplying bulk power to major consumers such as the refinery. A 220 kV double circuit over-head line is under construction to interconnect Abu Dhabi with Al Ain (160 km) through Wathba and Shaikh Khalifa, where step down sub-stations will be provided to supply electricity to neighbouring towns.

2.65 Al Ruwais is not covered by the activities of the Abu Dhabi Electricity and Water Department, which is responsible for supplies in the Emirate. ADNOC is proposing captive power station to cover the demand of its large projects such as the 120,000 b/d refinery.

2.66 In Dubai, the Dubai Electricity Company is responsible for power supply in the Emirate. The total effective generating capacity in Dubai in mid-1978, totalled 298 MW. Two 25 MW gas turbine units could be operative in August 1978. A steam power station in Jebel Ali is under construction connecting the above steam station with six substations in the area.

2.67 The Sharjah town is supplied by the Electricity Department of the Emirate. The rural areas of the Emirate are under the jurisdiction of the Ministry of Electricity and Water. The total installed generating capacity of Sharjah is 210 MW. Two steam units, each 75 MW are under construction. The first unit is expected to be commissioned by 1980.

2.68 Ajman has installed generating capacity of 61 MW comprising relatively small diesel and gas units.

2.69 The Ras al Khaimah town is supplied by the Electricity Department of the Emirate, but the rural area is under the jurisdiction of the Ministry of Electricity and Water. The total generating capacity, mainly diesel units, was 91.6 MW. A new steam power station is under construction with a capacity of 240 MW. During the summer of 1977, shortage of electricity was observed in Ras al Khaimah town and as a result, a load shedding was enforced.

2.70 The total generating capacity of the Fujairah town is only 9.5 MW composed of diesel units. Overhead line of 33 kV is operating

between Fujairah and Dibba town (50 km).

2.71 Sharjah is only 17 km from Dubai; Ajman 10 km from Sharjah; Umm al Quwain 25 km from Ajman and Ras al Khaimah less than 100 km from Umm al Quwain. However, no power connections exist between them. The existence of small generating units explains, to a major extent, the high cost of power generation in UAE.

2.72 The electricity demand in UAE has been rising at unprecedented rates. This is likely to continue for several years.

2.73 While a three-year period is considered a very short time-span to determine the future growth, but the following figures of peak loads in leading cities and towns show nevertheless the trend:

	(M e g a w a t t s)			Increase 1978 over 1976 %
	<u>1976</u>	<u>1977</u>	<u>1978</u>	
Abu Dhabi	160.0	240.0	290.0	81
Al Ain	35.0	NA	80.0	118
Dubai	167.0	200.0	300.0	79
Sharjah	na	100.0	160.0	60*
Ajman	11.65	19.6	35.0	200
Umm al Quwain	4.5	6.5	14.0	211
Ras al Khaimah	na	47.0	66.0	40*
Fujairah	3.3	8.03	14.0	324

* Based on one year.

2.74 The average per capita consumption of electric energy in UAE is considered one of the highest even when it is compared to some industrialised countries. Although the electric energy consumed in industry at present does not exceed 10 per cent of the total electric energy consumption, the high rate is mainly due to the use of a large number of air-conditioning units by residential and commercial consumers.

2.75 Detailed analysis of expected power generating capacities demand show that there would be shortages by 1982 or earlier in certain areas. This is due mainly to the larger demands being planned by the manufacturing

industry. The power shortages are expected in the following areas: Abu Dhabi, Al Ain, Dubai and Sharjah.

2.76 Several agencies are involved in the generation and distribution of electric power in UAE. Necessary co-ordination does not exist among them. There is too much division of authority and uniformity of voltages is lacking.

2.77 The power network in UAE is fragmented: the loads and generating plants are not connected to one integral network. Interconnected networks in developed and developing countries have led to reliability of supply, savings in reserve capacity to meet the demand, improvement in operational economies, better utilization of energy resources by building stations near the sources and savings in manpower.

2.78 Three fuels are used in UAE by the power industry: natural gas, crude oil and diesel oil. The cost of diesel oil has been high. No uniform accounting system is adopted to enable computation of the exact costs. It is reported that the cost of generation in some stations is about 20 fils/kWh. This figure rises at other stations to more than 35 fils/kWh.

2.79 The high production costs are due to small generating units and stations, high initial cost, high operation cost due to types of machines used, namely, gas turbines which are high consumers of spare parts when used as base loads and high fuel cost.

2.80 The tariff has been fixed by the Federal Government at a flat rate of 7.5 fils/kWh. Some Emirates have their own rates, such as:

Abu Dhabi	7 fils/kWh (for nationals)
	12 fils/kWh (for others)
Sharjah	10 fils/kWh
Ras al Khaimah	10 fils/kWh

2.81 Many industrial enterprises have received delayed and erratic power supplies. In one case, a small company installed a generating unit which is now surplus.

2.82 Due to very fast development in UAE and considering the costs and other problems of power supply, it is the considered opinion of the

Team that a basic requirement of the power industry is long range planning, while monitoring and review should be followed on an annual basis.

2.83 Considering the long construction time of power stations, and anticipated shortages of electricity in 1981, steps should be taken now to plan suitable generating units and stations.

2.84 Steps should be taken to develop a national-grid. Interconnections should be encouraged with substations to serve load centres as well as rural areas. New units/stations should be oriented, as much as possible to central steam stations located either at load centres or fuel centres. Such stations should service water desalination plants as well.

2.85 It is essential to adopt a uniform standardised accounting system to enable cost comparisons and economies. The policy of Government related to fuel cost and other operating factors should be clearly defined.

2.86 Steps should be taken to adopt a uniform tariff based on maximum demand use and energy consumption. A concessional special tariff should be introduced for major industries, particularly, energy-intensive industries. A graduated tariff system would serve the purpose.

2.87 An autonomous body, within the Ministry of Electricity and water should be created and entrusted with the responsibilities of generation and transmission of power all over UAE, while the distribution may remain a function of the Municipalities and local government units.

Transportation

2.88 There is no railway system, existing or proposed, in UAE. The roads, therefore, play a pivotal role in the transportation of men and materials in the country.

2.89 First class asphalt coastal roads now connect Ras al Khaimah, Umm al Quwain, Ajman, Fujaira, to Sharjah, Dubai and Abu Dhabi. With the completion of the northern road systems, roads from UAE will connect Dibba and Khor Fakkan in UAE with Muscat in Oman. Smaller centres are being connected. With the completion of the stretch between Tarif in Abu Dhabi and Al Sila on the Qatar border, there would be a link, through the transcontinental route, between the northern population clusters of UAE and Europe.

2.90 Transportation costs are high despite the fact that fuel is cheap and plentifully available. Efforts in the direction of the development of a transportation system which is less expensive will help in the development of industry by eliminating small pockets of markets, each attempting to satisfy its own needs. Easy mobility (at low cost) is an essential of a dynamic, fast growing industrial market.

2.91 In 1977 the total number of vehicles was approximately 140,000. The composition was as follows:

Cars	106,000
Trucks	22,000
Others	11,000
	<hr/>
	139,000
	<hr/>

2.92 A shipping company has been formed by the Government of UAE in partnership with Governments in the Gulf region, namely, Kuwait, Saudi Arabia, Qatar and Iraq. It has a subscribed capital of Dh 7,000 million. A wholly-owned fleet of 51 cargo vessels with a tonnage of a little over a million DWT is already operating and 7 vessels of over 160,000 DWT are soon to be delivered. The fleet accepts containers, palletised and break-bulk cargo with heavier lifts of 300 tons and long lengths upto 65 metres.

Other infra-structural facilities

2.93 As an illustration of the massive development outlay made by the Emirates, the case of Dubai is referred to with further details. The leading projects of Dubai include:

	<u>Investments</u> (million Dh)
Dry dock	1,320
Expansion of Port Rashid	1,000
Dredging and reclamation of Dubai Creek	300
Expansion of Dubai Airport	800
Dubai International Trade Centre	600
Water and Electricity Supply	120

2.94 The giant dry dock will be completed in 1979. The complex will have three docks which will be able to handle two vessels each of 500,000 DWT. There will be in all 8 berths and one tanker clearing berth capable of handling virtually any kind of repair and maintenance work.

When in operation, it will employ some 4,000 workers with a potential for employment of 10,000.

- 2.95 A scheme to develop a complete industrial zone at Jebel Ali Port (near Dubai) was launched in 1976 and is in progress. The complex, which is intended to function as a free zone for industry and labour, is to include a steel plant, a Dh 2,600 million liquefied petroleum gas plant and a number of other factories. An aluminium smelter is under construction which will have a production capacity, in the first stage, of 135,000 tons/year with an employment involvement of 1,200 workers. A dry gas processing plant is included in the scheme. Letters of Intent have been signed with a European Company to build a steel plant, with the Emirate of Dubai holding an 80 per cent share. A refinery has been programmed at Dubai with a capacity of 200,000 b/d.
- 2.96 Like at Jebel Ali, plans are under preparation for the development of a large industrial zone at Ruweis, in the western region of Abu Dhabi, near the present Jebel Dhanna crude oil export terminal. A contract for the development has been concluded with an American Company.
- 2.97 The industries located at Ruweis will be primarily based on the use of natural gas, gas liquids and crude oil as feedstock and fuel. The main source of the hydrocarbons will be from the onshore oil fields. Eventually the complex will include petrochemical facilities and an iron and steel plant.
- 2.98 Ruweis was preferred as a location for the industrial complex because it combines good site conditions, a reasonable distance to the onshore fields and access to relatively deep water near the shore in a marine area with some natural protection. The western portion of this deep water basin currently serves crude oil tankers loaded at the Jebel Dhanna Terminal.
- 2.99 In order to support the large industrial projects, the company is developing an infrastructure of utilities and services to ensure the smooth operation of all plants within the complex.
- 2.100 All Emirates, with the exception of Umm al Quwain, have allocated industrial areas for the development of industries. In most cases, there are more than one industrial areas.

2.101 The size of industrial areas differs from one area to another, even within the same Emirate. The areas, differ, likewise, by the facilities provided by them. Apparently, no definitive policy has been developed. The policy is fluid and is allowed to develop as the developing conditions demand.

2.102 In some of the industrial areas, such as those in Abu Dhabi and Sharjah, supply of infra-structural facilities has not been provided for in advance with the result that no proper roads are available for access to the plants. In Sharjah, the industrial area is located almost at the edge of a dumping ground, which is a source of infection, not to mention that it is an unaesthetic and repulsive landscape for the new development.

Technological development

2.103 Due to short industrial history, there is a perceptible technological gap. By the use of sophisticated equipment, the speed of assimilation is fairly high; nevertheless, it is a long way before UAE could be self-reliant. The problem is aggravated by the sudden spurt of activity.

2.104 Conscious of the need to keep pace with the global developments and to secure the deepening of the technological intensification in UAE, several steps have been taken and planned. Illustratively, UAE has proposed at the Rabat Conference on science and technology that Arab Countries spend 0.5 per cent of GNP for research and development and a special fund of \$ 500 million be created for application of science and technology. The conference also set a goal of 500 Arab scientists for every million people. The cooperation among the Arab States was to be extended in specific areas such as development of solar energy, impact of irrigation projects on the environment, preservation of marine life and environment, development of desert technology.

Population and labour force

2.105 It would bear repetition that manpower is the most significant condition of development in UAE. This constraint has both quantitative and qualitative facets. Much of what is anticipated and recommended in this study would depend on the population size and its structural pattern. Certain assumptions have been made on the future growth but these are

only indicative. The Team is of the view that a definite policy in this area will make the development process in the country less expensive in terms of national economic costs.

2.106 The population of UAE was estimated to have expanded to 862,000 at the end of 1977. References were made to the rapidly growing population, with a high inflow of expatriates during the period 1973 to 1977. The natural growth rate of the national population has been of the order of 3.3 per cent of per annum. By world standards, the rate is very high; by the demands of economic development of UAE, the absolute growth is too low. It is low because of its quantitative size.

2.107 By age and sex structure, the population in 1977 was as follows:

<u>Age Group</u>	<u>Male</u>	<u>Female</u>	<u>Total</u>
Upto 14	119,100	108,000	227,100
15-24	136,700	46,900	183,600
25-44	299,300	67,200	366,500
45-54	38,300	12,800	51,100
55 and above	<u>20,300</u>	<u>13,400</u>	<u>33,700</u>
Total:	<u>613,700</u>	<u>248,300</u>	<u>862,000</u>

Source: Ministry of Planning, Central Statistical Department, Annual Statistical Abstract, 1977.

2.108 With the naturalisation, if it takes place, of the magnitude which is envisaged, there would be a significant change in the sex and age structure of the population with its impacts on the participation rate. At present, the sex-ratio is preponderantly male and the age-structure favours adult population. These characteristics are the direct consequence of a large number of short and medium term migrant labour. In other words, the entrants to the work force will not be in proportion to the anticipated/projected expansion of the population size.

2.109 The labour force estimates in UAE in 1975 are shown below. The estimates include those of the age of 10 and above and exclude, the disabled, housewives (75,600), students (44,400) and those unwilling to work (4,300).

	<u>Male</u>	<u>Female</u>	<u>Total</u>
Total	286,600	10,000	296,600
Employed	280,800	9,500	290,300
Unemployed	5,700	500	6,200

* Source: Ministry of Planning, Central Statistical Department: Statistical Agenda 1978. (Reproduced by UAE Currency Board Bulletin, Vol.4, No. 1).

2.110 The occupational pattern of the economically active population in 1975 presented the following picture:

	<u>Male</u>	<u>Female</u>	<u>Total</u>	<u>%</u>
Professional/Technical	17,700	4,300	22,000	7.4
Administrative, managerial, clerical and sales	53,100	2,200	55,300	18.7
Production and related	154,100	100	154,200	52.0
Others	<u>61,700</u>	<u>3,400</u>	<u>65,100</u>	<u>21.9</u>
	<u>286,600</u>	<u>10,000</u>	<u>296,600</u>	<u>100.0</u>

Source: Ibid.

2.111 Of the total work force of approximately 300,000, a little over one-half were in production related activities; the total number of all establishments is less than 27,000.

2.112 A very small work force of about 7,000 is engaged in agriculture, half of which is located in Ras al Khaimah. The work-force in the manufacturing industry is around 30,000.

2.113 In 1977, the expatriate work force was drawn from some 40 countries with the following approximate distribution: Arabs 20 per cent; non-Arab Asians 60 per cent; and the balance 20 per cent from other countries, of which 5 per cent came from Western countries.

CHAPTER 3

INDUSTRIAL GROWTH DYNAMICS AND STRUCTURE

Size and growth of the manufacturing sector

3.01 The manufacturing sector is small both in absolute and relative terms. The total gross value added* generated by the sector was around Dh 700 million in 1977, giving a per capita gross value added (GVA) of about Dh1,000. The contribution of the subject sector was less than 2 percent of GDP in the year.

3.02 The gross value of output, at current prices, has shown an appreciable rise over the base of 1972. It expanded by more than 5 times.

	<u>Gross Value of Output*</u>	
	<u>(Million Dh)</u>	<u>Index</u>
1972	425	100
1973	543	128
1974	728	171
1975	910	214
1976	1,455	342
1977	2,140	503

3.03 Even after making discounts for the relative price rises, the expansion was substantial. This is the result of a low base in 1972, a large flow of incomes and investments, generation of additional demands and a wide spectrum of opportunities unfolded by the rapid economic growth following the rises in international oil prices.

3.04 The growth was spread over most of the sub-sectors as shown in the following table:

	<u>Gross Value of Output (1977)</u>	
	<u>(Million Dh)</u>	<u>Index</u>
		<u>Base 1972 = 100</u>
Food products	344	344
Paper and paper board	25	313
Printing	135	450
Wood, wood products and furniture	150	300
Petroleum products and chemicals	570	1,900

* The figures in the text do not tally with the results of the Industrial Survey 1978 since the latter did not cover the entire manufacturing sector.

Basic metals and metal products	220	310
Engineering industries	150	500
Non-metallic mineral-based products	390	707
Miscellaneous industries not covered elsewhere.	156	306
	<u>2,140</u>	<u>503</u>

3.05 The structural change in the manufacturing industry, denoted by gross value of output at current prices is set out in the following table:

	<u>Sub-sector</u>	<u>Share in Gross Value of Output (percentage)</u>		<u>Variation between 1972 and 1977</u>
		<u>1972</u>	<u>1977</u>	
1.	Food	23.5	16.1	-7.4
2.	Paper Products and Printing	9.0	7.5	-1.5
3.	Wood and Wood Products	11.8	7.0	-4.8
4.	Petroleum Products and Chemicals	7.1	26.6	+19.5
5.	Non-Metallic Mineral-based	12.9	18.2	+ 5.3
6.	Basic Metals	7.1	3.3	- 3.3
7.	Metal Products and Engineering	16.7	14.0	- 2.7
8.	Miscellaneous	12.2	7.3	- 4.9
	Total	<u>100.0</u>	<u>100.0</u>	

3.06 Only two industrial sub-sectors, petroleum products and chemical industries and non-metallic mineral based industries expanded their relative shares in total gross output of industry at the cost of all other sectors. (This, however, does not mean that the other sectors contracted their output.)

Dispersal of industry

3.07 Of the 597* identified establishments employing 10 or more persons, according to the Establishment Survey 1977 conducted under the auspices of

* Detailed data on Industrial characteristics of 501 units that responded to the Industrial Field Survey, 1978 are set out in annexes to this Report.

of the Central Department of Statistics, UAE Ministry of Planning, the largest number 160 (26.8%) were based on non-metallic mineral products and represented mainly the building materials industries. This category was followed in close proximity by metal-working industries with 140 establishments (23.5%). These two classifications accounted for 5 out of every 10 large identified establishments.

3.08 Among the smaller establishments the major part, approximately half, was represented by one classification, namely, textiles and leather. This was due to the inclusion of a large number of tailoring shops and repair and maintenance workshops.

3.09 The distribution of the larger establishments by Emirates showed that Dubai led the way with a share of over 40 per cent. Abu Dhabi, the second largest, followed with a perceptible gap, claiming a share of 24 per cent. With the addition of Sharjah, 84 per cent of establishments are covered.

3.10 The pattern is substantially different among the smaller establishments with Abu Dhabi leading, although only marginally, over Dubai (27.1 per cent against 26.8 per cent).

Developing signs of industrial thrust

3.11 In 1974, the industrial product pattern was simple and limited. Most of the units produced commodities of daily consumption or building materials. In many cases, a simple process of conversion, blending or packaging was involved with very little added value. From the point of substantial industrial activity, there are others which do not deserve mention, such as processing of colour films, production of gravel and asphaltized gravel, glass cutting for doors, windows and photo frames.

3.12 The most diversified pattern among the 7 Emirates was presented by Dubai. This was followed closely by Abu Dhabi. Sharjah and Ras al Khaima belonged to the second category of diversified pattern. There was hardly any industrial activity in the other three Emirates.

3.13 The product pattern has not changed substantially; but nevertheless, some notable additions have been made, which represent products of modern industry.

3.14 The UNIDO Survey Mission 1975 had estimated on, what it called, a conservative basis, the projects in the pipeline representing an investment of over Dh 20,000 million. This was against an estimated investment of Dh 700 million in 1974.

3.15 Some of these projects, however, were in early stages of planning and involved, in a few cases, multiple planning efforts. Other projects belonged, at least partially, to infra-structural sector not confined precisely.

3.16 The magnitudes of investments, should not, therefore, be considered representative of the projected expansion of the industrial sector. Some of the projects were of doubtful validity, at least in the then stage of development, and had to be deferred, if not abandoned.

3.17 The identified projects involved an employment potential of 50,000 to 75,000 against the 1974 estimate of 19,000. The investment ratio worked out to a high figure of Dh 265,000 per person engaged.

3.18 Most of the identified projects were large, but some were marginal, if not of sub-economic capacities.

3.19 The projects involved diverse ways of external cooperation: finance and technical collaboration, supply of machinery, know-how and engineering sources, erection of plants, turn-key contracting. This is the general pattern of other projects now being implemented.

3.20 The Abu Dhabi National Oil Company has sponsored many large industrial programmes, some of which are in production, some under construction and others in various planning stages.

3.21 A refinery in the Ruweis Industrial Zone, to meet the local demand for petroleum products during the 1980s, is under construction. It will have an operating capacity of processing 120,000 b/d of local crudes and will produce:

	<u>Thousand tons/year</u>
LPG	100
Premium gasoline	550
Regular gasoline	300
naphtha	75
Kerosene	850
Gas oil	1,500
Fuel oil	1,800

3.22 A contract for the engineering, design, procurement and construction supervision was signed in March 1977. The refinery is expected to be on stream in the early part of 1981. The capital cost of the project was put at about Dh 2,000 million to be financed wholly by ADNOC.

3.23 As part of a huge programme to gather, liquefy and export associated gas produced in the onshore oil fields of Asab, Bab, Sahil and Bu Hasa, a gas processing plant in Ruweis Industrial Zone is being constructed. The plant will utilise associated natural gas to produce about 3 million tons per year of LPG and about 2 million tons per year of condensates.

3.24 Contracts for the gas extraction installations and the Ruweis fractionation plant were awarded in 1977. The first phase of the project would come on stream in late 1979, while the second phase will be operational by 1980.

3.25 ADNOC is currently undertaking feasibility studies for a Liquefied Natural Gas facility to process associated gas from the onshore oil fields. Two plant capacities are being considered:

- 4.5 x 10⁹ cubic metres per year of NG
- 9.0 x 10⁹ cubic metres per year of NG

3.26 The Ruweis Industrial Zone was chosen as a site for the plant, and it is expected to be on stream by 1983/84.

3.27 A nitrogenous fertilizer plant has been planned. Associated gas from the onshore oil fields of Bu Hasa, Bab and Asab will be utilised to produce ammonia and urea. Production is expected to commence late in 1981 with expected capacity of 500,000 tons per year of ammonia and 330,000 tons per year of urea.

3.28 Preparations are finalised for the construction of a plant in Umm al Nar to exploit the saline solution of the water desalination plant to produce about 65 tons per day of hydrochloric acid and 87 tons per day of caustic soda, in addition to other industrial chemical products. Construction commenced in 1977, and the plant should be on stream by 1980.

3.29 The plans are under way also to construct a plant in Al-Sediyat Island to process 50,000 tons of Barite and 10,000 tons of Bentonite per year, as well as other petroleum industry chemicals. Production is expected to commence late in 1978.

3.30 Studies are under way to build a plant at the Umm al Nar Refinery site, to produce about 50,000-70,000 tons per year of asphalt for road building and water proofing uses. The total capital cost of the project is estimated at Dh 50 million and production is anticipated to commence in 1980.

3.31 To meet the demand for pipes for water supply, irrigation and cables, a plastic pipes factory has been set up in collaboration with a Japanese firm at Masfah industrial area, 20 km from Abu Dhabi. It has an initial capacity of 2,400 tons/year of pipes of various sizes.

3.32 The industrial development programme of Petroleum Department of Abu Dhabi alone is, to put it modestly, very impressive. It involves an investment of the following magnitudes:

	<u>Million Dh</u>
a) establishments operating	300
b) establishment under implementation	600
c) establishment under study and various stages of planning and contracting.	1,800

3.33 Tables 3.01 to 3.03 outline the basic characteristics of the projects. When the projects in the pipelines are completed, the total investments will have reached some Dh 3,000 million. Even if the iron and steel complex is excluded from these estimates, the investment will still cross the Dh 1,500 million mark.

3.34 The leading industrial projects in Dubai include:

	<u>Million Dh</u>
A natural gas project and petroleum refinery	1,600
Aluminium smelter	2,400
Steel plant	1,400

3.35 These three projects alone will account for a capital outlay of Dh 5,400 million.

3.36 The cement factory at Ras al Khaimah has been in production since 1976. The cement plant at Sharjah went into production in 1977 and the plans for expansion were mooted before it went into commercial production.

3.37 In Umm al Quwain, an Asbestos cement products factory is under construction with an initial capacity of 20,000 tons/year. It is

TABLE 3.01

OPERATING ESTABLISHMENTS OF PETROLEUM DEPARTMENT
OF THE EMIRATE OF ABU DHABI

March 1978

Project	Location	Product/Capacity	Project Cost (million Dh)	Start-up	Source of Consultants	Source of Contractors
Al Ain Cement Plant	Al Ain	Ordinary Portland Cement: 200,000 tons/year	103.0	1976	Switzerland	Japan
Calcium Silicate Brick Factory	Al Saad	Calcium silicate bricks: 40 million/year	11.6	1977	U.K.	U.K.
Abu Dhabi Compost Plant	Abu Dhabi	Compost: 150 tons/ day garbage & sludge processing.	28.4	1977	Italy	Switzerland
Abu Dhabi Steel Works	Abu Dhabi	Steel bars and sections: 20,000- 25,000 tons/year	10.6	1977	Pakistan	UAE & Pakistan
Abu Dhabi Bag Factory	Abu Dhabi	Cement paper bags: 30 million/year and plastic bags: 100-120 kg/h	39.8*	1978	Switzerland	Switzerland
National Corpn. for Silos & Flour Mill.	Abu Dhabi	Wheat flour: 200 tons/ day and by-products; Silos: 30,000 ton capacity	107.6*	1978	Sweden	Finland

* Estimate.

Source: Department of Petroleum, Emirate of Abu Dhabi.

TABLE 3.02

INDUSTRIAL PROJECTS UNDER IMPLEMENTATION OF
THE PETROLEUM DEPARTMENT OF THE EMIRATE OF ABU DHABI

March 1978

Project	Location	Product/Capacity	Cost (million Dh)	Date of Commence- ment	Execution Period	Source of Consultants	Source of Contractors
Extension of Al Ain Cement Plant	Al Ain	Ordinary Portland Cement: 550,000 tons/year	413.00	1977	29 months	Switzerland	Japan
Al Ain Compost Plant	Al Ain	Compost: 150 tons/ day of garbage & sludge processing	39.00	1976	18 months	U.K.	Switzerland
Extension of Abu Dhabi Compost Plant	Abu Dhabi	Compost: 450 tons/ day of garbage & sludge processing	95.00	1977	28 months	U.K.	Switzerland
Concrete Block Plants	Al Wathba, Al Ain	Concrete blocks 19 mm blocks/year	39.00	1977	18 months	Switzerland	Switzerland

Source: Department of Petroleum, Emirate of Abu Dhabi.

TABLE 3.03

PROJECTS UNDER STUDY OF THE EMIRATE OF ABU DHABI

PETROLEUM DEPARTMENT

March 1978

P R O J E C T	Capital Cost Estimate (million Dh)	Capacity	Status
Lime Plant	49.6	100.tons/day	Contract pro- posed
Steel Pipes Plant	200.0	42,000 tons/ year	Joint venture with a Japan- ese firm
Reinforced Plastic Plant	65.0	150 km pipes/ year	Joint venture signed
Iron & Steel Complex	1,000.0	400,000 tons/ year envisaged	Under study
Extention of Abu Dhabi Steel Works	150.0	100,000 tons/ year	Under study by a Japanese firm
Animal Feed Plant	74.0	ND	Consultants invited
Automatic Bakeries	60.0	ND	Consultants invited
Macaroni Plant	20.0	ND	Consultants invited
Ice Factories	40.0	ND	Consultants invited
Mineral Water Bottling Plant	50.0	ND	Under study by a French firm
Electric Cables Plant	100.0	ND	Consultants invited
TOTAL	1,808.6		

ND = Not Determined.

Source: Petroleum Department, Emirate of Abu Dhabi.

anticipated that for the first two years, domestic consumption will absorb the entire production; later, the expanded capacity will be used for exports.

3.38 In Sharjah, a major plant was established for assembly of air-conditioning units. It commenced production in 1976. The unit has a capacity of assembling 20,000 units annually and was set up at a capital cost of Dh 100 million. The capacity was to be doubled to cater to the export markets in Kuwait and other Gulf countries.

3.39 In Ras al Khaimah, a large industrial complex, Khor Khwair is being developed with many substantial industrial projects in petroleum, building materials and other industrial sub-sectors.

3.40 The review in the present section gives the indications of major development in the industrial sub-sector. It does not cover a large number of other projects operating, under construction, in planning stages or under contemplation. It also is not representative of the relative level of activity in the several Emirates and industrial sub-sectors.

Industrial field survey

3.41 To collect data on basic industrial characteristics, both structural and operational, a comprehensive field survey was conducted under the present project.

3.42 The industrial establishments, each employing 10 and more workers, were covered on a census basis. Out of a total of 595, response was received from 501. The smaller establishments consisting mainly of tailoring shops and repair workshops were covered on a sample basis. A random sample of 5 per cent from a 'universe' of 2,700 was selected. In classifications that had less than one establishment, one establishment was taken. The sample thus comprised 138 units. The distribution of the larger establishments and their employment is tabulated in annexes to this report.

3.43 The questionnaire of the survey provided information on

- a) industry classifications based on ISIC;
- b) location, ownership category and legal status;
- c) investment structure;

- d) fixed assets and capital formation;
- e) manpower and salary/wage structure;
- f) capacity, production, sales, exports;
- g) material inputs;
- h) utilities, their sources and costs;
- i) distribution channels;
- j) foreign collaboration;
- k) expansion programmes, their nature and capital costs.

3.44 The survey attempted in the case of one parameter, output, to locate a five year trend of growth as an indicator of variation in the industrial activity.

3.45 Apart from the statistical data, the questionnaire was extended in one area to cover an opinion survey. This covered the problem areas. Some 22 problems were identified on which assessment of the managements were sought on their respective problems by three rankings:

- a) critical,
- b) important,
- c) casual.

3.46 Some of the results now available from the computations of the survey results are presented as annexes to this report. These throw revealing light on the present industrial structure and operations of the sector.*

* In view of the non-availability of the results at the time of the preparation of the present report, an analysis and study could not be attempted in any depth. In all some 100 tables are being produced covering different characteristics both structural and operational, of the existing industry in UAE.

CHAPTER 4

APPRAISAL OF INDUSTRIAL OPERATIONS

General evaluation of industry

4.01 The evaluation by the UNIDO Team from visits to factories and the discussions held with the managements, executives and technical personnel and the information collected from documentation, leads to the following major conclusions:

4.02 The industry operates in an atmosphere of secrecy, and therefore, isolation. There is need for mutual sharing of information and experiences for promotion of inter-linkage among industrial units.

4.03 Most industrial enterprises have been promoted by impulsive motivations. They are not initiated or supported by pre-investment studies. With fairly liberal flow of capital, the investor tends to leap into a project without advance programming and is in a hurry to conclude contracts. No studied search is made to locate the right contractors/suppliers/consultants/collaborators. The widely divergent fixed capital investments in cement plants indicate the need for more rigorous pre-investment planning.

4.04 In only a few cases, comprehensive and dependable market studies have preceded project implementation. The business community appears to consider such studies as theoretical exercises. This has, among other causes, led to gross under-utilisation of capacities, involving avoidable blocking or waste of scarce resources and producing unsalutary results on industrial investment climate.

4.05 Institutional framework for operating industry is not standardised and regulated with the result that management practices are not effective and efficient.

4.06 Despite the need for trained managerial, commercial and technical personnel, there is no serious effort to develop manpower; an easy recourse is made to the belief that trading experience is enough for industrial management and that employment of a few expatriates — not always fully qualified for the jobs which they occupy — will do the rest.

4.07 Professional industrial management, as distinguished from clever trading practices, is conspicuous by its absence. There is need for progressive adoption of professional and trained management practices. In brief, the industrial management in the country needs professionalisation.

4.08 Rationally developed management, financial and production planning is not used for industrial operations.

4.09 Capital structure, in the absence of a suitable institutional framework, is not broad-based. There is need for a mechanism which will promote a wider capital base for industrial capital.

4.10 Taking advantage of the large industrial opportunities and the lack of industrial experience of the investors, consultancy services in many cases have misguided and misdirected the industrial activity.

4.11 Many projects pass through long gestation periods. This tends to increase fixed capital costs. Implementation of programmes need to be monitored and controlled more effectively.

4.12 Visits to industrial zones have shown that more detailed advance preparation is necessary. When industrial areas are developed, it is not sufficient to just make the land available. Infra-structural facilities such as roads must precede and not follow establishment of factories. In one case it was found that there was not only no road constructed, but the industrial zone was located by the side of a large and filthy dumping ground.

Appraisal by the business community

4.13 Contacts of the Team with the business community at the level of businessmen, industrial and business executives and technical personnel and directors of Chambers of Commerce, led to a number of interesting and revealing conclusions.

4.14 While the business community has the background experience in trade and commerce but only limited, if any, experience in manufacturing it is keen to explore new avenues and opportunities in industry.

It is conscious that the rate of return is low and the gestation period for obtaining the returns is long in industry. It, however, recognises that the future lies with industry.

- 4.15 There is a nearly complete lack of information in regard to:
- a) the industrial potential of UAE;
 - b) State policy in regard to industrial development;
 - c) the role the State expects the private sector to play in the matter of industrialisation;
 - d) restrictions governing industrial development,
 - e) incentives/concessions and material support which industry can expect from the Government;
 - f) the extent of long term financial assistance, financial institutions such as the UAE Development Bank or the banks would be prepared to provide.

4.16 The business community, in general, has the feeling that the main responsibility of industrialisation has been undertaken by official agencies and organisations. It is apprehensive that since the, Emirate Governments have undertaken, directly or indirectly, large and small projects, in consumer and intermediate goods industries alike, the businessmen would not have the capacity to compete with them.

4.17 The community feels also that in the present stage of development of industry in UAE, specially in the context of similar activities all along the Gulf, investments, unless protected by the Government, would be highly risky.

4.18 The community recognises that the sector represented by them does not possess the necessary skills of management of industry. They, therefore, would welcome

- a) substantial participation, including capital participation from foreign industry;
- b) initiation and manpower development in the science and practices of industrial management.

4.19 The business community has a predilection for joint ventures with industrially advanced countries. Its awareness of the capabilities of the sister countries is limited. Moreover, it prefers high and sophisticated technology which should not give rise to operational problems and for the deployment of which the foreign partner is prepared to take full responsibility. It is, however, the feeling of businessmen that the

cost of foreign association with companies from industrialised countries is high.

4.20 The Chambers of Commerce appear to be divided on the question of their willingness or ability to undertake industrial studies and thereby to assist directly the business community. One of the Chambers welcomed the idea of establishing a separate division for industrial studies with the proviso that the Government makes clear its policies in respect of industrial development defining the relationships of and scope for the private and public sectors and the extent of support the private sector can expect from the Government.

4.21 The business community feels, not unexpectedly, that the substantive support of the Government to industry has, with some exceptions in one or two Emirates, been very limited and marginal. The policy in regard to financial assistance needs to be completely overhauled if substantial industrial development effort has to be undertaken by the private sector. Without soft lending facilities on a substantial scale, the private sector would not have the necessary capability to undertake large scale industrial development.

Management appraisal by sectors

4.22 The industrial establishments engaged in production of food materials were appraised in depth, indicative of the problem of industrial operations and management. A few leading conclusions are set out in the present review.

4.23 Food products are expensive with extensive choices to offer. Numerous super-markets in the UAE stock domestic, European and American canned and packaged food products.

4.24 The problems and bottlenecks in the development of food industries are not peculiar to UAE. Most of these have been faced by other countries, especially during their early stages of development. Some of the plants are based on the most modern know-how and technology, and are of fairly large size. Others require redesigning, expansion or even closure. Three of the cases that deserve such action are the following:

	<u>Recommended Capacity (Tons/Year*)</u>	<u>Estimated Investment (Million Dh)</u>	<u>Additional Manpower Required *</u>
Redesign of Ras al Khaimah Fishmeal Plant	4,000	Negligible	-
Renovation of Sotex Co., Sharjah	600	8.00	10
Redesign of Small-scale Bakeries	600	0.30	3

* Based on single shift.

4.25 Standards of consultation to evaluate and control projects are not well-established. The multiplicity of authority granting licences or registration for the establishment of new industries, the absence of co-ordination between projects and a lack of laws governing the operations impede the development and balanced distribution through optimal locations of food and related industries. Activity in food industry is isolated and the industrialisation programmes are promoted in accordance with the needs of each investor. A policy of co-ordination between all Emirates will help food industries to avoid duplication of similar projects and avoidable expensive competition.

4.26 There is an absence of proper quality, weight, hygiene and health controls. Among the visited plants, exceptions were the large flour mills, some dairies, an ice cream plant and automatic bakeries in Dubai and the municipal slaughter-house in Al Ain. Water connections are often given on the same basis as for households. Quality control for water is not practised in most cases. In some others, no water connections are available and the industry relies on supplies by tank-trucks.

4.27 The capability of some managements in existing or planned food industries to absorb new technologies is limited, resulting in the establishment of similar capacities with low productivity and low capacity utilisation levels.

4.28 There are not enough experienced management planners in the food industries to shape the development effort, not enough middle-

managers to implement the programmes effectively and not enough skilled workers to operate the plants. The foreign unskilled manpower is constantly moving. Cheap, unstable, not fully-trained workers can not become the basis of high technology-oriented food industries.

4.29 Most of the new large plants possess modern automated machinery. The maintenance of most plants, other than the very recently established ones, is, on the whole, poor. No market surveys identifying the consumer preferences and other market characteristics are undertaken with the result that it is the changing responses of the market which determine the performance of the industry.

4.30 The local industry has not grown in a balanced and rational manner. The locations are not optimal.

4.31 The products of the domestic industry are distributed, in many cases, in the Emirate of location, though, for some food products, marketing throughout the UAE is emerging.

4.32 An efficient agricultural marketing system is essential for supply not only of fresh fruits and vegetables but also of raw materials for processing by the manufacturing industries.

4.33 The management pattern of building industries may be divided into two groups: (a) modern, automated, large plants, and (b) traditionally managed small labour-intensive production facilities.

4.34 By and large, all large plants possess good equipment and, broadly speaking, efficient production management. The cement plants and the automatic cement block plant fall in this category. However, the technical areas are not fully supported by commercial management and planning. The small plants are inefficient, producing output of questionable standards.

4.35 The observation on building materials industries apply also to the metal-working industry, which is, by and large, non-existent in any substantial way.

4.36 The basic metals and petro-chemical industry is non-existent. In the latter sub-sector may, however, be included the plastic pipes plant, the detergent plant and the plastic bags factories. The

plastic pipes plant, sponsored by the Emirate of Abu Dhabi is under production management of a Japanese collaborating firm. The two simple extruders are being managed efficiently. In the case of the detergent factory, the capacity utilisation is low, not because of production management problems but due to a low market penetration, the market being exposed to imported products. The plastic bags factories are the result of individual efforts of small entrepreneurs. The demand in the market is too low for the capacities created. These plants demonstrate, once again, the need for effective pre-investment planning, in particular, by means of well-designed market surveys.

CHAPTER 5

CONDITIONS AND CONSTRAINTS

Climate for industrialisation

5.01 A strategy for industrialisation, which secures the targets of development at minimal socio-economic costs, must take cognisance of the conditions for and constraints on industrial development. In the earlier sections of this study, references to these conditions were made at the relevant stages, while setting the goals of the industrial growth process, in appraising the resource base and in identifying the available and developing infra-structure. This has led to a clearer picture of the positive and negative factors, now outlined in a consolidated form which should govern the strategy for industrial development.

5.02 The Emirates have commissioned a number of industrial prospect studies. The industrial planners appear, by and large, to be pessimistic about the industrialisation of UAE. They are discouraged by the oft-repeated constraints. They are obsessed further by (a) a short background of industrial history and culture in the country, (b) the reluctance and shyness of capital and enterprise to re-direct itself to the manufacturing activities, attracted as it is by quick and high returns in the trade and construction sectors. Industry on the other hand has long gestation periods with moderate and steady returns.

They are a little over-awed by similar and mammoth industrial programmes being launched by other countries in the region, some of which have faced under-utilisation of capacities and even closures. They are dissuaded from proposing large capacities in certain industrial sectors such as down-stream petro-chemical networks, because of surplus capacities and, sometimes, recessionary conditions in the international supply markets.

5.03 The UNIDO Industrial Survey 1975 noted such pessimism expressed by several studies in the early periods. These studies were, however, made in the 1960s and the new potential, now visible, was not unleashed then. The promise has grown mainly since 1973. Nonetheless, the pessimism still persists and is expressed in many ways, in discussions, debates, dialogues and documentation.

5.04 The force of economic power of internationally convertible capital resources is not fully recognised. A massive shift in purchasing power has, in the recent years, taken place which will generate expanding world demands.

5.05 It is the conviction of the UNIDO Team that the pessimism is misplaced and does not recognise the dynamics of the developing economic equations in the international economic structure. Given a rational, integrated, well-directed and monitored industrial development blue-print, UAE can and should embark on an ambitious, bold industrial programme.

5.06 The UNIDO Team of 1975 also concurred with this view. They observed that "the range of positive factors is impressive. The sources of industrial opportunities are manifold. The formation of the United Arab Emirates and the six-fold (or more) growth in the national demand for manufactured products indicate that a different market is being dealt with in 1974 than was the case in 1968". It may now be added that the conditions in 1978 are substantially more favourable than what they were in 1974 — and not only a decade ago. This does not imply, even indirectly, that there are no limits to the potential and that the development process can follow the traditional path.

Positive factors favouring industrialisation

5.07 Among the positive factors contributing to industrial growth of UAE, one which is recognised by all, is the availability of a cheap and plentiful energy source and abundant supply of the feed for refinery products and petro-chemical complexes, including fertilizer plants. The range of potentialities in the petro-chemical sector is extensive in the intermediate and final consumer product areas, for both durables and non-durables.

5.08 The UNIDO Team does not share the pessimism of some who are concerned about the short-term balance of payments position of UAE created by transfer payments for both productive and extra-productive purposes. Nor is it discouraged by an apparent shortage in the capital market generated by restrictive lending policies of the banks. This latter policy was actuated by the inability of borrowers, principally in the construction sector, to meet their scheduled banking obligations.

5.09 Other positive factors favouring industrialisation of UAE are the following:

- a) abundance of capital resources, a chronically limiting factor in developing economies;
- b) a free access to world markets for acquisition of technology, capital equipment and raw materials as a result of a most favourable long-term balance of payments position;
- c) the desire of the country to diversify the economy in favour of industrialisation;
- d) free trade policies without external trade and exchange restrictions;
- e) practically customs-free imports of machinery, spares and raw materials;
- f) an absence of taxes, direct and indirect, which in most developing countries discourage both local and foreign investments;
- g) cordial economic and commercial relationship of UAE with the Western industrialised countries, developing countries, countries in the Gulf region and of the Arab world, leading to relatively free access to the industrial and technological experiences of other communities;
- h) an absence of socio-economic problems, such as poverty and unemployment;
- i) an absence of a lop-sided, obsolete, high cost industrial structure which may require replacement, rehabilitation and modernisation;
- j) acclimatisation in the early stage of industrialisation in UAE to high technology and automated machinery and equipment contributing to high productivity;
- k) the positive attitude of the governments contributing to the simultaneous growth of both the public and private sectors without restrictive prohibitions on either;
- l) a geographical location which is in the hub of the oil-affluent markets and not far away from the industrialised markets of Europe and the developing markets of the East;

- m) location of major population agglomerations close to the coast-line giving easy access to international trade traffic;
- n) a fairly adequate transport system despite its seemingly non-diversified character — good-metalled roads generally adequate for the current industrial requirements;
- o) low cost of industrial fuels which would tend to be lower with the commissioning of the large refineries now under construction or in various stages of planning and development.

Constraints on industrialisation

5.10 Most of the constraints affecting industrialisation in UAE stem from two basic limitations: limited resources of manpower and raw materials.

5.11 The small population of the country is, perhaps, the most potent constraint on future industrialisation that UAE could launch, commensurate with its capital resources and with the need to balance its economic structure. The small population has at least two impacts. It limits the size of the domestic market and the supply of work force needed, which can provide the base for a large industrialisation programme. There is an acute shortage of manpower at all levels including management and technical personnel, skilled and unskilled workers. There are limits to the import of expatriate manpower, both socially and economically. Imported manpower is relatively unstable in the social context and represents divergent technical and professional competence.

5.12 A limited and undiversified material resource-base is another major constraint. The only really abundant material resources are oil and natural gas. Another resource is marine food. Fishing and fish processing industry have been expanding in recent years. Discovered mineral resources are limited both in variety and quantity. Limestone discoveries have, however, led to a rapid growth of the cement industry. The cement products industry is also developing fast; so are those based on lime. Due to the shortage of water, the agricultural sector has remained small. Despite government efforts, the sector was neglected in recent years as a result of other more lucrative vocations and income-opportunities available to the local population. The scarcity of water has not only affected agriculture, but it is also a major problem for several industrial units requiring substantial quantities of water.

5.13 The geographical conditions which act as a drag on industrial growth are:

- a) a relatively small area;
- b) primarily uniform desert terrain;
- c) severe climatic conditions specially in the areas away from the coast-line;
- d) corrosive character of atmospheric conditions at the coast-line which possess practically all major population concentrations.

5.14 Climatic conditions tend to raise investment costs owing to the need for insulation and air-conditioning. These also tend to make the physical conditions less hospitable for expatriates who demand higher compensation. Because of hot and humid climate, productivity is low. With breaks in working hours, the available effective time is reduced. With high temperatures prevailing during most part of the year, storage costs are high. The heat leads also to a higher wastage factor, especially for perishable commodities, both in the course of transportation and storage.

5.15 There is an almost complete absence of technological base in terms of technical institutions, equipment manufacturing, technical management and research and development infra-structure in all its facets.

5.16 The industrial effort may have been a little too free. No real direction in terms of a well-conceived design of development or of guidelines, and technical assistance is available. In the Emirate of Abu Dhabi, however, a three-year plan was developed.

5.17 An institutional framework for development of industry has been missing. There are no really effective institutions available for

- a) fixed capital financing;
- b) capital market subscriptions and transfers;
- c) management development and consultancy;
- d) manpower development and training;
- e) technological information and development;
- f) testing facilities.

5.18 In a country endowed abundantly with cheap energy source, which could be a countervailing factor against other high cost centres, the power supply to industry is expensive.

- 5.19 There are no dependable repair and maintenance facilities. The factories have to maintain their own individual arrangements and to stock a high inventory of spares. With ageing of the plants, the problem could become critical.
- 5.20 Labour costs are high when compared to similar costs in other developing countries. The cost of management personnel is also high since most of them are expatriates and demand substantial benefits. The work compensation rates (total including benefits) for personnel coming from western countries are at least twice the prevailing rates in Europe.
- 5.21 Costs of erection and civil construction of factories are also high; this contributes to high capital investments and, in turn, to high capital charge as a cost component.
- 5.22 The cost of acquisition of management expertise acquired from internationally operating companies tends to raise the costs of overheads to untenable levels. This does not mean, by implication, that the necessary management expertise should not be acquired. Such acquisition is, perhaps, in the long run the cheapest way since it prevents, by and large, initial problems and low capacity utilisation of new industrial ventures. Nonetheless, in competition with international supply sources of competing products, the additional cost tends to become a disadvantage.
- 5.23 International competition is intense in the domestic market. There is no protection available against nearly customs-free imports.
- 5.24 Owing to initial large capacity sizes of plants (dictated by economic or standard sizes) and lower market penetration co-efficients, capacity utilisation of industries remains low contributing to high unit costs.
- 5.25 In many cases, especially in the private sector, no proper pre-investment studies are conducted before launching projects. There is low-awareness about the utility of pre-investment planning among private industrial promoters.
- 5.26 There is a reluctance on the part of the business community to shift from trading and construction activities, and also from the services sectors. The opportunities in sectors other than industry to which the attention of entrepreneurs has gravitated, are easier to manage and offer

very attractive returns. Trade and commerce, despite its being highly competitive in certain fields, has offered very good returns. It is a matter of common impression that the investment in a multi-storeyed building or a villa has a pay-out period of two or three years. No manufacturing activity can offer that kind of return. The expansion of population through a migrant work-force has contributed to the affluence of other sectors as has inflationary conditions both within UAE and in the international markets.

CHAPTER 6

REGIONAL INDUSTRIAL DEVELOPMENT AND POLICY

6.01 Industrial development in the UAE cannot be viewed in isolation from developments which are taking place in the Gulf region and other Arab countries, particularly the neighbouring petroleum producing countries. The developments have direct relevance to the risks to be taken when investment decisions are made involving large financial and material resources. The risks arise from geographical proximity, relatively small population of each country leading to limited domestic markets, similar and competing factor endowments and development programmes.

6.02 On the positive side, by concerted and complementary action, the group can secure more effective international bargaining position. There are several aspects, such as development and transfer of technology, which can be organised more effectively at reasonable costs only by joint action.

6.03 In 1976, the total population in eight Gulf countries, Bahrain, Iraq, Kuwait, Oman, Qatar, Saudi Arabia, Yemen and Democratic Yemen, exceeded 31 million:

	<u>Population (in millions)</u>	
	<u>1976</u>	<u>1985*</u>
Bahrain	0.27	0.36
Iraq	11.51	16.20
Kuwait	1.03	2.17
Oman	0.79	1.07
Qatar	0.10	0.13
Saudi Arabia	9.24	12.17
Yemen	6.78	9.05
Democratic Yemen	1.75	2.29

* Estimated.

Sources: UN Monthly Bulletin of Statistics, February 1973.
Les perspectives d'avenir de la population mondiale
évaluées en 1968, ST/SAC/SER.

6.04 On the basis of assumed rates of growth for the two periods covering a decade beginning from 1976, the total population in the eight countries is expected to rise to about 36 million in 1980 and to a little over 43 million in 1985.

6.05 Except for one country, the growth of GNP (at current prices) has been significantly high (see Table 6.01). The economic conditions have been marked by inflation during the subject years; but even after providing for it, the real growth in most of the countries, has been spectacularly high. UAE, being the subject country, is not listed in the table, but it is one of them.

TABLE 6.01
RATES OF GROWTH OF GNP OF SELECTED ARAB COUNTRIES
AT CURRENT PRICES,
1968-1975
(Percentage per annum)

Country	1968- 1973	1973- 1974	1974- 1975
Bahrain	7.5	36.3	40.2
Iraq	14.2	100.2	24.6
Kuwait	22.0	81.9	NA
Oman	19.4	281.7	18.0
Qatar	8.8	326.2	2.1
Saudi Arabia	25.9	185.1	60.5
Yemen	16.8	3.7	NA
Democratic Yemen	4.2	15.6	14.1

Source: UN National Accounts, Printout, September 1977.

6.06 National income accounts indicate that the petroleum exporting countries are becoming progressively more dependent on the petroleum sector. In Iraq, for example, where economic activities are relatively more diversified than in other countries in the region, the share of its petroleum sector in GDP had risen from about 32 to 55 per cent between 1970 and 1975 (see the following table). In the other petroleum producing countries, dependence on the petroleum sector has become almost absolute, with the share of the sector in GDP rising to as high as 80 per cent as in Kuwait and Saudi Arabia. As a reciprocal, this dependence is progressively reducing the relative importance of other sectors, including the industrial sector. The share of the petroleum sector in GDP in selected countries is shown in the following table.

Country	Year	Percentage
Iraq	1970	32.0
	1974	55.0
Kuwait	1970-71	67.8
	1974-75	77.1
Oman	1974	52.6
Saudi Arabia	1969-70	47.0
	1974-75	81.5
UAE	1975	70.0

Source: Reports or papers presented to the Fourth Conference on Industrial Development for the Arab States.

6.07 The trend toward heavier dependence on petroleum has taken place despite the commendable efforts that have been made to accelerate the pace of development of other activities, particularly manufacturing. The annual rates of growth in the industrial sector in a number of petroleum exporting countries have been, on the whole, fairly high as shown in Table 6.02.

TABLE 6.02

GROWTH RATES OF THE MANUFACTURING SECTOR IN SELECTED COUNTRIES

Country	Period	Annual Rates (percentage)
Iraq	1965-1969	9.1
	1970-1974	13.8
	1978-1980	9.7
Kuwait	1966/67-1971/72	11.0
	1966/67-1969/70	7.0
	1970/71-1975/76	22.1
	1976-1980	15.2
Oman	1970-1975	71.9
	1976-1980	51.0
Saudi Arabia	1970-75	14.0
	1974/75-1979/80	14.0
Democratic Yemen	1971/1972-1973/74	6.9
	1974/75-1978/79	21.4

- Notes:
1. The rates shown here are either actual or planned under national plans.
 2. In Iraq, a very high rate is projected for 1975-1980 period.
 3. In case of Kuwait, the 1976-1980 rate excludes oil refining and petro-chemicals.

Sources: Reports or papers presented to the Fourth Conference or Industrial Development for the Arab States.

6.08 The planned rates of growth of the manufacturing sector for the current planning phase, 1976-1980, are much higher than those that were actually achieved in the preceding periods. In Kuwait and Saudi Arabia, these rates have been set at an average rate of around 15 per cent per year. Iraq envisages under its five year plan as high a rate of growth for its manufacturing sector as 31.9 per cent per year.

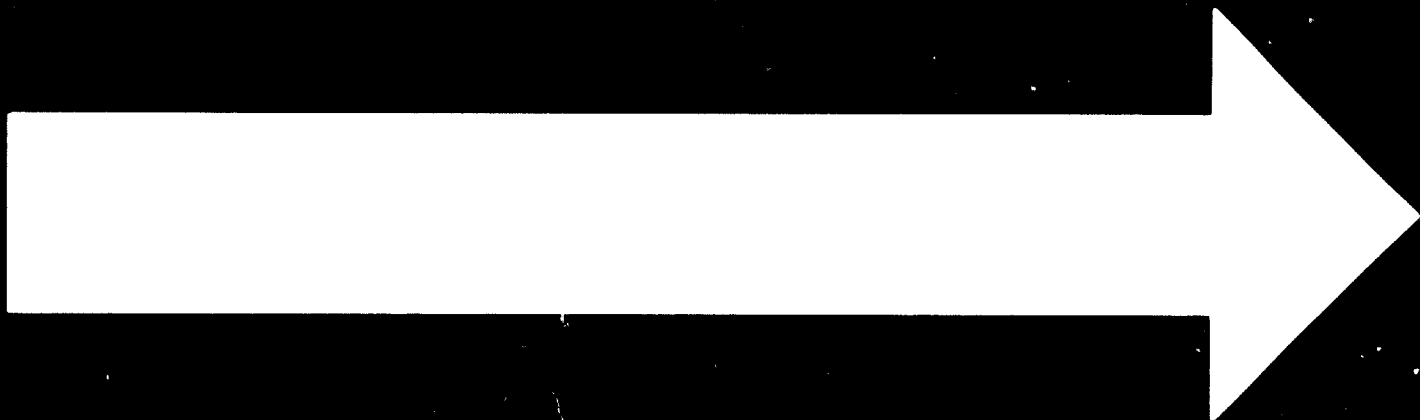
6.09 Comparable data are not available for the recent years, but if the gap between the per capita gross value added by domestic manufacturing industry and consumption of manufactured goods were to be narrowed even partially in the countries under review, it would call for a development effort in the next two decades, which would seem unattainable without joint co-operation. The gap has widened since 1973 as a result of a spurt in imports of manufactured goods consequent upon rise in oil revenues.

6.10 Practically all Arab countries in the region have adopted development plans for the 1976-1980 period, and have given high priority to the development of manufacturing industry, of both the import substitution and export-oriented types. The major petroleum exporting countries have emphasised expansion in industries which use petroleum and natural gas as feedstock or have high energy-content. The non-petroleum countries have given priority to the development of a wide range of import substitution industries which utilise local raw materials.

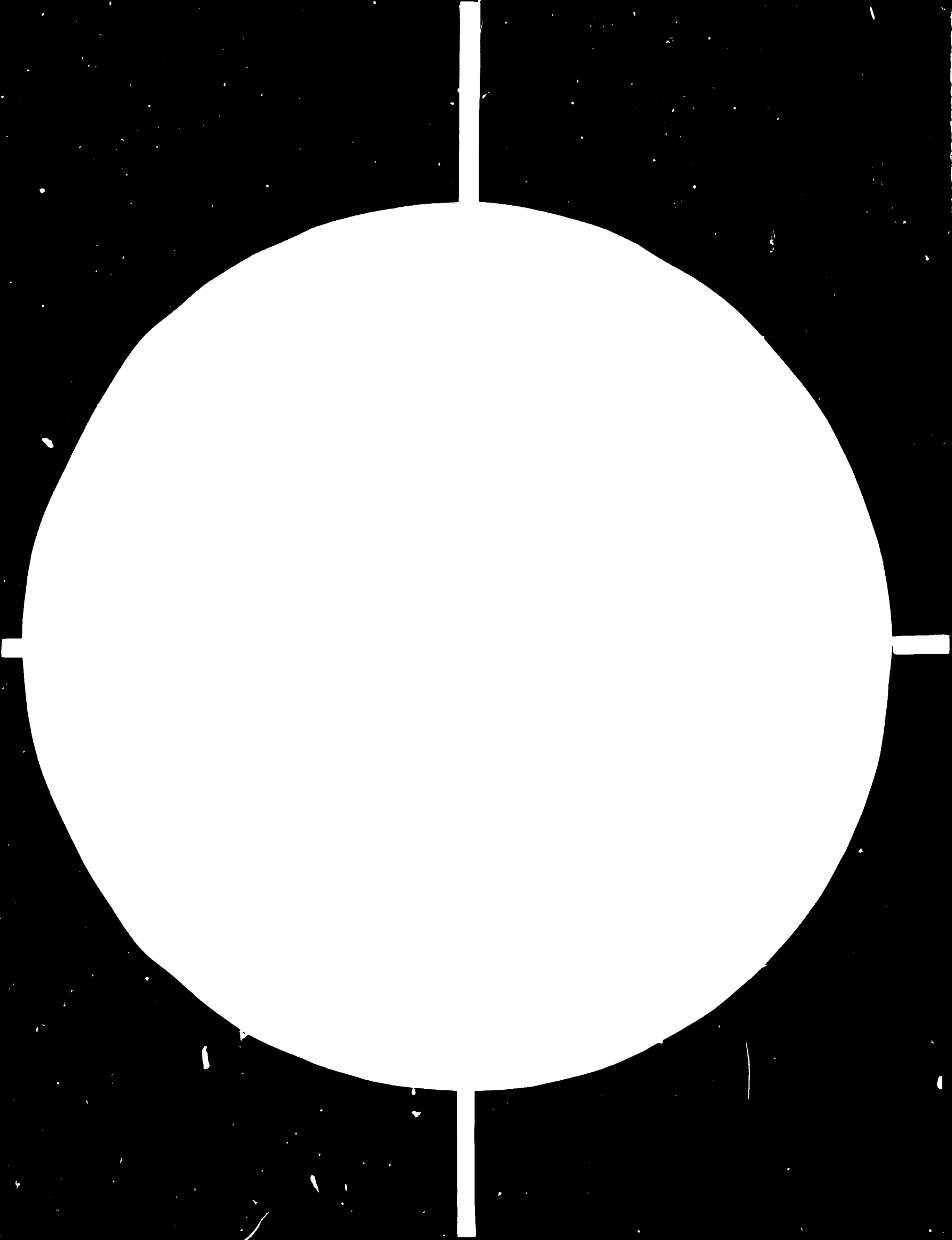
6.11 The volume of investment which has been earmarked by the petroleum exporting countries for industrial projects in the 1976-1980 period, has been raised dramatically over the preceding planning periods. Investments, for example, in Saudi Arabia, allocated for manufacturing projects aggregate to more than US \$ 14,000 million, of which more than 30 per cent is earmarked for petroleum-based projects. Major projects included in the plan are enumerated in the following table.

6.12 In addition, the Plan allocated further outlay to petroleum refining capacities and the production of cement (from 1.15 to 10 million tons). In the private sector, the Plan estimated that 900 new industrial enterprises would be established during the plan period involving an employment of about 28,000 workers and investments equivalent of US \$ 2,200 million. Products identified for expansion include food and beverages, textiles and clothing, wood and furniture, paper and paper products, chemicals, non-metallic mineral-based products, basic metal, metal processing, machinery and equipment.

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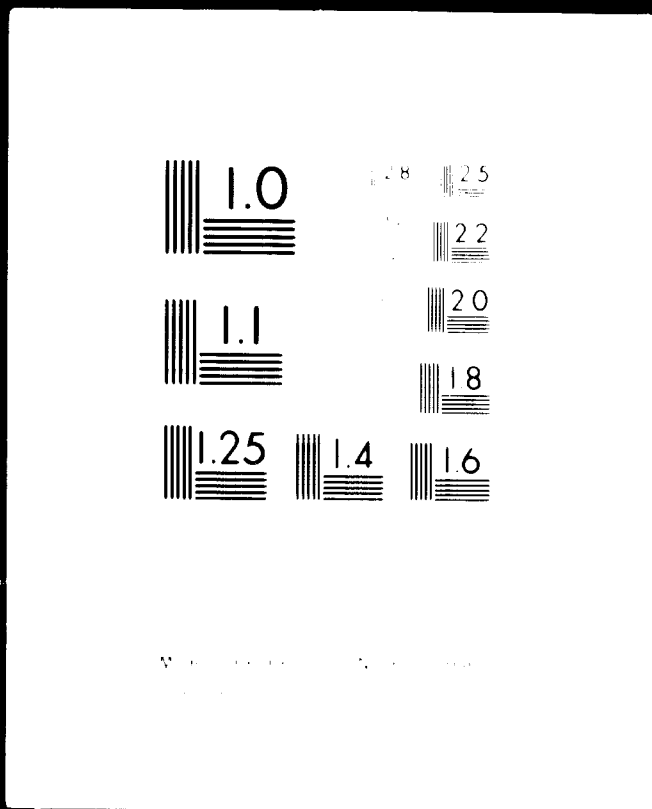


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6.13 The planned investment in the major industrial projects in Qatar aggregate to the equivalent of some US \$ 3,000 million during the period 1976-1980. The major projects include:

<u>Project</u>	<u>Expected completion</u>	<u>Estimated investment (US \$ million)</u>
Fertiliser (second stage)	1978	380 *
Cement (fourth stage)	1980	200
Iron and steel	1978	300
Petro-chemicals	1979	550
Gas liquefaction	1978	400
Refinery (150,000 b/d)	1980	380

* For both stages.

6.14 Qatar plans to establish a public organisation for light industries with a substantial participation by the private sector. The main products considered for production in this sector include construction materials, paints, detergents, food, edible oils, tooth paste, paper products and plastics.

6.15 The major projects of Iraq include a sponge iron and steel plant complex with a capacity of 1.2 million tons, a petro-chemical complex for the production of 120,000 tons of ethylene (and down-stream conversion to polyethylene), liquefaction of associated gas (for exports), petro-chemical complex (for domestic use and production of urea), increase in cement capacity from 2.5 million tons in 1975 to 23 million tons in 1980. Cement, among other, would be produced for exports in the region. Other products cover a very diversified field:

various types of cables, basic electrical and household equipment, transport machinery and equipment, glassware, textiles, phosphatic fertilizers, sulphur and other chemicals.

6.16 Iraq, while being a rich oil-exporting country, plans to develop small-scale industries. This is actuated mainly by employment considerations and may not be relevant to UAE.

6.17 It is not necessary to multiply the cases of other countries since the pattern is, by and large, the same. Illustratively, again, the plans of Kuwait (total estimated investment in 1976-1980 period: US \$/ 4,000 million) include 5 major projects by KNPC at a cost of US \$/ 1,800 million. The product mix include petro-chemicals, fertilizers, cement asbestos products, cement, batteries, metallic pipes, animal feed, yeast, ceramics, wheat flour, prefabricated houses.

6.18 In Table 6.03 are indicated the values and major areas of investments in selected countries.

6.19 The countries in the Gulf area are faced with a host of constraints, some are common while others are specific to individual countries. Several industrial projects based mainly on hydrocarbons might ultimately be established in almost all petroleum producing countries possibly of sizes which are optimally suited to export markets. If such projects continue to be undertaken on a national basis and in isolation of similar developments taking place in other Arab countries, the export market might, from time to time become saturated, causing drastic reduction in the utilisation of capacities created at high capital costs and involving scarce technical and technological capabilities. An industrial development strategy which is mainly based on the production of major petroleum-based projects would render these countries vulnerable to external factors which are beyond the control of individual countries. Unless properly analysed and co-ordinated, this type of an industrialisation strategy may fail to create the backward and forward linkages which are essential for the erection of a sound and balanced industrial base capable of further growth in the future.

6.20 This should not even indirectly imply that the processing of available raw materials, particularly of petroleum and natural gas, should not be undertaken. On the contrary, these resources should be effectively utilised for the creation of a sound industrial base and should be used as an instrument for effecting important changes in the structure of the regional industry. Rational and adequate protection on a regional basis should be provided to infant industries to enable them to compete effectively in the regional and international markets, subject to the criteria based on a sound industrial strategy.

TABLE 6.03

PLANNED INVESTMENT IN MANUFACTURING

PRIORITY AREAS AND MAJOR PROJECTS IN SELECTED COUNTRIES

1976-1980

Country	Investment in manufacturing (Million \$)	Share of Manufacturing in total Development Expenditure (%)	Major projected Development Areas
Iraq	11,500	25	Petro-chemicals and fertilizers, sulphuric acid and sulphate, iron and steel, cement, electrical and engineering products, cables and rods, tyres and tubes and paper products.
Kuwait*	4,500	25	Petroleum refining, petro-chemicals and fertilizers, building materials including cement, liquefied gas, prefabricated houses, cables, household products, ceramics and food products.
Oman	325	10	Mainly building materials and food products.
Qatar	3,000	NA	Cement, petroleum refining, fertilizers and petro-chemicals, liquefied gas, iron and steel, building materials and other light consumer goods, in addition to the development of industrial infrastructure.
**			
Saudi Arabia	14,400	30	Mainly hydro carbon-based industries, gas collection and processing, petro-chemicals, petroleum refining, iron and steel, aluminium and fertilizers. Other industries include flour milling, agricultural processing and food products, building materials and household products.
Syria	3,000	21	Fertilizers, paper products, tyres, glassware, cement, textiles, cables, scrap metals and metallic pipes, electronic equipment, iron and steel, aluminium sheets, beverages, food processing, vegetables oils and sugar.
Yemen			Food processing, wood and paper products, building materials, ceramics, leather products, light metal processing and simple basic chemicals.

continued

continued

Country	Investment in manu- facturing (Million \$)	Share of manu- facturing in total Development Expenditure (%)	Major projected Development Areas
Democratic Yemen	14.8	NA	Cotton textiles, leather and rubber footwear, plastics, fish canning and other fish products, aluminium uten- sils, table salt and animal fodder.

* About 82 per cent of the investment in industry earmarked for petroleum-based projects.

** Almost 60 per cent of the funds allocated for manufacturing to be used for petroleum-based industries.

Source: See Table 6.02.

TABLE 6.04
MAJOR PLANNED INDUSTRIAL PROJECTS IN THE PUBLIC SECTOR
IN SAUDI ARABIA
 1976-1980

Project	Capacity	Investment (Million \$)	Employment
Seperation and collection of gas.	16 million ft ³ /day	4,500	2,200
Petro-chemical complexes in Eastern Region (4)	2 million tons/year	2,500	1,800
in Western Region (1)	0.5 million tons/year	640	1,700
Lubricating oil	107,000 b/d day	580	550
4 Fertilizer Plants	2 million tons/year	400	2,000
Aluminium Plant	210,000 tons/year	370	1,600
Steel Plant	1.6 million tons/year	480	1,235
TOTAL		9,470	6,485

Source: See Table 6.02.

6.21 Serious consideration should be given to the creation of inter-industry linkages among the Arab countries which, taken together, possess the pre-requisites for establishing a sound and rational base for industrial development. The principle of inter-industry linkages, where appropriate, may be extended to include other developing countries, the economies of which complement with those of the immediate regional group. This process could be further extended to include some of the more advanced countries which possess management capabilities, know-how and markets.

6.22 Efforts in the area of economic cooperation have been made by Arab countries during the last quarter of a century, and a number of Arab regional institutions have been established for this purpose. However, the results have not been commensurate with the efforts exerted in the past. The causes have been analysed on several occasions of the failure to achieve the desired results which stem basically from the fact that the framework within which cooperation has been conceived was inconsistent with the prevailing political and economic realities. Economic cooperation must be achieved in stages and at varying levels. Efforts at achieving the final stage without having prepared the ground for the earlier stages is bound to frustrate the process of cooperation.

6.23 Regional cooperation, to be effective, could be planned in the following phases:

- Phase I : Exchange of industrial information;
- Phase II : Mutual cooperation in industrial planning;
- Phase III : Joint consultation for industrial project programming with country wide sharing of industrial activity in defined competitive and complementary areas;
- Phase IV : Establishment of institutional infra-structure;
- Phase V : Joint financing of projects and programmes;
- Phase VI : Joint project promotion and management.

6.24 The phases are not essentially chronological in character. The attack has to be multi-pronged on many fronts. Nevertheless, the efforts would be more effective if the international cooperation is organised on a selective, stage-by-stage, programmed basis with an eye on results.

6.25 In order to move in the desired direction, an industrial data bank should be established as a first step. Now that the Gulf Organisation of Industrial Consultancy (GOIC)* has been established, the initiative could be taken by it. All relevant information within the UAE and other Gulf countries should be pooled, again, stage by stage. The Data Bank and the GOIC hopefully will be the fore-runners of more effective regional cooperation

6.26 Efforts at co-ordination should also move from the stage of generalities to specific consultations based on an in-depth analysis of the implications involved in the development of specific branches of industry, and in some cases, of specific commodities, say, fertilizers, aluminium, cement, refined petroleum products, sugar, textiles. The individual commodities should become the subject matter of intensive consultations in terms of global position and future prospects with special reference to existing and planned capacities, potential world demand, technology, marketing, pricing and cost of production, the role of multinational corporations, deployment of skills and manpower.

6.27 Among the several measures mooted towards consolidation of the efforts of the Gulf States towards industrialisation, a notable one as earlier indicated, is the establishment of the Gulf Organisation for Industrial Consultancy. Based on the decision of the Conference of Ministers of Industry held in Doha, Qatar, in 1976, it is a step in the right direction.

6.28 The organisation has, inter alia, the following objectives with a view to achieving industrial cooperation and co-ordination among the member states:

- a) to collect and publish information on industrial development projects and policies;
- b) to develop proposals concerning the establishment of common industrial projects;
- c) to give advice on co-ordination among industrial development projects;
- d) to co-ordinate and develop technical and economic cooperation among the existing or planned industrial companies and establishments;
- e) to provide technical assistance to prepare and evaluate industrial projects;
- f) to prepare statistics and studies concerning industry.

* / See 6.27 to 6.29.

6.29 The Member-States which participated in the decision were: Bahrain, Iraq, Qatar, Kuwait, United Arab Emirates, Saudi Arabia and Oman.

6.30 The Inter-Arab Investment Guarantee Corporation was established in 1974, and it commenced its operation in April 1975. UAE among other 18 countries have subscribed to it. The objective of the corporation is to insure investments from losses resulting from non-commercial risks which the investments may encounter in any of the member countries. The corporation was to start with an "open-ended" capital based on an initial amount of ten million Kuwaiti Dinars. This was later raised to KD 25 million.

6.31 The Corporation covers three risks: a) confiscation and nationalisation, b) non-repatriation or delayed repatriation of investment and returns, c) war and revolution risks. All three types of investments are protected: a) direct participation, b) portfolio investments (ownership or shares, stocks and bonds), and (c) loans.

6.32 The UAE has participated also in the establishment of a joint industrialisation programme, the Arab Industrialisation Organisation (AIO), along with Saudi Arabia, Qatar and Egypt. Reportedly, UAE was committed to contribute Dh 284 million in the current year's budget of Dh 1,160 million. At its Abu Dhabi meeting in February 1978, AIO decided to establish a joint company for electronic industries based in Saudi Arabia. There would be similar complexes in UAE.

6.33 A study launched by the Industrial Development Centre of the Arab States (IDCAS) is in progress which seeks to identify specific opportunities for mutual co-operation among the Arab States. The study is expected to be completed by the end of 1978 and it is hoped that it will propose some concrete measures for mutual cooperation.

CHAPTER 7

STRATEGY FOR INDUSTRIALISATION

Rationale of industrialisation

- 7.01 A major issue for economic decision-making is the one between a slow and an accelerated rate of industrialisation. In quantitative terms, the slow rate of growth of the manufacturing sector may be defined as a rate which does not exceed the rate of the overall growth of the economy. In other words, industrialisation is not used as an instrument to correct the imbalance of the economic structure.
- 7.02 Apparently, there are no two opinions on the basic premise that the imbalance in the economic structure ought to be corrected. This raises a further question: why should the role of correcting the imbalance not be performed by other sectors, other than the manufacturing sector?
- 7.03 At the present time in UAE, there is no other sector which has the capability of accomplishing this task of structural transformation. The presently dominant sector of construction, as shown by recent experience, has demonstrated visually, and unmistakably, serious limitation to its growth. The boom in the construction industry in UAE has produced signs of recessionary conditions affecting not merely the sector itself, but in fact, also other economic activities.
- 7.04 The recent experience of the construction industry can be viewed as a short term phenomenon which may not repeat itself. Unbridled growth in the manufacturing sector as well is likely to produce similar results. It is, therefore, necessary to analyse the future potential of the construction sector.
- 7.05 Housing appears to have reached a saturation point at the present stage of development. Improvement in the rate of growth of housing will mainly depend on population growth. The growth of the expatriate component is to be kept at lower levels. The quantitative growth of the local population will be marginal from the point of view of stimulating housing activity. There is a large scope for the expansion of social services, but in terms of growth of the construction industry, it would be limited.

7.06 Owing to a shortage of water and relatively low productivity, agriculture has tended to be the less preferred sector. While agriculture will be, as it were, rehabilitated, with substantial resources now being invested and the keen interest shown by the Government, its contribution cannot be such as to alter the structural pattern of the economy so as to reduce the dependence on the oil sector.

7.07 Transportation and commerce are somewhat collateral activities. If the oil sector is not to expand; if agriculture has limited potential; if the contributions of agriculture cannot be substantial; and if the industry — a negative hypothesis—is not permitted to have an accelerated growth, then, as a corollary, transport and commerce cannot contribute substantially to rectify the structural imbalance. The conclusion then is that the construction and other collateral sectors cannot, without the accelerated growth of the manufacturing sector, have substantial expansion as a corrective factor.

7.08 A further question emerges: with the high per capita income, among the highest in the world, why should UAE attempt, at all, to achieve accelerated growth of any sector with the attendant risks, creating new socio-economic problems in the process, such as the absorption of a large intake of expatriate population?

7.09 Assuming for a moment that no sector is expanding rapidly, one or more of the following consequences would occur with little or no growth in manufacturing:

- (a) UAE would continue to save enormous capital surpluses, with the risk of depletion by inflationary impacts;
- (b) UAE would have substantial increases in consumption levels without matching them with productive activity, which would mean continuing dependence on other countries not only for marketing oil and gas but also for its essential and not-so essential consumption requirements.

7.10 For purposes of this study, it will suffice to say that with the developing conditions in the global energy market, no country can consciously pursue a policy of continuing overwhelming dependence on mono-commodity structure, which would be subject to wide variations in demand and supply.

It is demonstrated in the present analysis that, in the given conditions, the only sector which has the potential to minimise the overwhelming dependence of the economy on oil, is the manufacturing sector.

7.11 On the positive side, the manufacturing industry should be the preferred sector for accelerated growth since it is the economic activity

- a) which is the most capital-intensive, and capital is the surplus factor;
- b) which is least labour-intensive, in relative terms, that is per unit of value added;
- c) which is technology-intensive, and technology can be acquired with capital resources without attendant social problems;
- d) which is the base for the expansion of other sectors including agriculture, mining, transportation and construction: or in other words, which represents the highest growth multiplier for other sectors;
- e) which has the best potential for participative investment in other countries, leading to benefits of industrialisation to UAE without essentially creating pressures within the country itself;
- f) which represents, relatively speaking, high international mobility;
- g) which will permit UAE in stages to convert the oil resource—which includes its sister commodity, natural gas—to a feedstock for the production of essential commodities for both home and international markets;
- h) which will enable, slowly but steadily, UAE to retain the value added generated by the oil sector which is now gained by importing countries;
- i) which will be in consonance with the global strategy envisaged under the Lima Declaration;
- j) which will lend to UAE the reciprocity in economic dependence with other countries, an index of economic self-reliance and freedom;
- k) which will blend the consumption patterns of UAE developed as a consequence of the imports of the modern products of industry with counterpart economic activity;
- i) which will strengthen the technological capability of the community.

Basic elements of strategy

- 7.12 The conditions are almost unique and there are a number of essential precedent and concomitant elements of a successful industrial programme in UAE, which should be accepted and adhered to.
- 7.13 The industrial strategy in UAE has to be highly discriminating and selective in order to achieve optimal resource allocation. The policy of selective industrialisation cannot naturally be promoted in a complete environment of free enterprise. This does not imply that private enterprise has to be abandoned as the tool for realising industrialisation. Free enterprise and private enterprise are not essentially synonymous. Private enterprise can be sustained in a semi-directed growth system.
- 7.14 The direction the industrial sector receives does not have to take the form of decision-making by the State machinery. The process of direction can be evolved through a system of selective incentives and compulsive conditions. If, for example, industrialisation should not be promoted in a given geographical area because of national policy preferences, an absence of infra-structure suitable for industrialisation in the area, would automatically prevent emergence of industry. Financing institutions may give preferential treatment to preferred industry groups in order to follow the selective strategy.
- 7.15 While there is scope for small and medium-sized consumer industries, the anticipated large dimensions of the industrial programme have to be based on capital-intensive and relatively large projects.
- 7.16 Small and medium-sized industrial units should be promoted as ancilliary or feeder activities, which will provide the industrial base and culture but these ought not to be allowed to distract limited manpower availability.
- 7.17 To maintain the expatriate work-force within the socially desirable and determined limits, further growth of trading and construction activity should be discouraged as a matter of national economic policy.
- 7.18 Industrialisation in UAE should not be based on fully integrated industrial activities, starting from the base material and passing through all intermediate stages of processing to the final product. This may call for bilateral and multi-lateral tie-ups.

7.19 Large industrial projects should invariably be promoted with established long term international linkages with countries which can supply input resources, know-how, management expertise or markets. For the supply of know-how, technology, skills and management expertise, the industrialised countries are preferred sources. For the supply of material resources, intermediate technology, management expertise and markets, the sister Gulf countries, Arab countries and Third World countries may provide the required association prospects.

7.20 All industries, whether large or small, heavy or light, producing industrial intermediates or final consumption goods, should be capital-intensive. The term capital-intensive need not imply large capitalisation: it only means high capital-net output (or value added) ratio. A small enterprise can be capital intensive, as a giant industrial complex can be labour-intensive. This fine distinction, often ignored, should be emphasized in the preparation of all industrial programmes.

7.21 The Government involvement should continue but an effort should be initiated to mobilise private savings and to canalise them into industrial activity. This needs a broad and stronger institutional base.

7.22 Provision of infra-structural facilities must precede industrial activity. It may seem wasteful but it would be highly productive if the development of infra-structural facilities is so geared that idle capacities in the infra-structure may be allowed to be created. Power and transport facilities should be provided at much lower cost which will be possible if the size of the generating plants is increased phenomenally.

7.23 Support and protection to industrialisation should be provided by provision of essential inputs on liberal and subsidised terms.

7.24 Two projects are good cases to demonstrate the need for negative industrial policy: (a) a mineral water bottling plant for export, and (b) asbestos plant (now under construction). The former demonstrates the need for restraining projects which, lured by profits, seek to export scarce resources. The latter must receive serious attention since asbestos is considered a health hazard and there is an increasing movement in the western countries to ban its use.

Extended industrialisation

7.25 Because of some critical constraints on industrialisation, UAE

may seek to achieve the objectives of industrialisation by what may be called 'industrialisation by proxy' or 'extended industrialisation'.

Any economic technique such as industrial development is not an object by itself; it is to serve some basic socio-economic goals. In densely populated low-income level countries, it serves the twin-objectives of eradication of unemployment and banishment of poverty. The basic goals to be subserved by industrial growth in UAE are to diversify the economy to reduce vulnerable dependence on oil and to secure steady returns on its wealth. At the same time, UAE must prevent pressures on its scarce resources.

7.26 The UAE will help and achieve the basic purposes of industrialisation by active participation in the management of joint ventures in other countries, especially those which have the potential of backward or forward linkage in UAE. Investment outside the country should not necessarily take the form of absentee partnership by buying stocks or investing funds. In all joint ventures, UAE investors, both public and private, should nominate their representatives and share some responsibility of management. This type of participative management will generate experience in industrial management among UAE nationals and will open further opportunities in UAE itself.

Technological choices

7.27 There can be no doubt that UAE will have to seek the most modern, up-to-date technologies. Set against the basic and powerful need, there are, nevertheless, few significant constraints that apply to the adoption of such technologies to local conditions. The quality and cost of available manpower is a major handicap. Domestic demand, which is relatively low, is another. The third one is the absence of industrial base-support in the form of ancillaries, facilities for maintenance, research and development institutions. Moreover, it is not foreseen that research capabilities will be developed in the near future.

7.28 The choices of technologies, avoiding large inputs of labour, and meeting other constraints and pre-requisites, will demand very discrete techno-economic business decision-making, leading to a productive and practical package of advanced and intermediate technologies.

7.29 The industrial project planner will have to distinguish between high capital costs of higher level technology and the relative factor prices

for substitute technologies. This distinction will provide also the rationale for making the right choices regarding supply sources for plant and equipment. In this area, a great deal of effort requires to be organised in UAE.

Rationale for a large number of food industries

7.30 In the food industries sub-sector, a very large number of small projects have been included under new potential opportunities. This is primarily due to the special characteristics of the sub-sector, while some of these would not contribute much real added value.

7.31 Small investors gravitate to simple investment opportunities which do not require specialised skills. These smaller opportunities, frequently found in agro-industrial sector, provide the new industrial entrepreneurs with the industrial experience needed before launching larger industrial ventures; and therefore, are of some significance in the UAE context.

7.32 Notwithstanding the special characteristics of the sub-sector, utmost care needs to be exercised in selecting new opportunities even in this area, lest these may become 'drag industries'. The basis yardsticks of productivity and of value added per unit of capital employed must be applied. In other words, however simple may be the manufacturing process, it should be least labour-intensive. A packaging plant, which does no more than simply pack the product, may also be acceptable as long as the packing methods are automated, engaging only a few workers.

7.33 Several opportunities in the food industries subsector have been located utilising the locally available raw materials, as a consequence of purposively planned development of agriculture, livestock and marine resources. Some of the material inputs of industry are a direct output of basic activities; others are by-products.

7.34 Moreover, it ought to be recognised, as indicated in earlier sections, (a) that balanced development cannot rely solely on large industrial units, and (b) that capital intensive industries are not essentially large industries. In fact, many small industrial units are essential adjuncts to large industries. The amount of capital is not an index of capital intensity; it is a relative concept. A highly automated bottling plant with a capital investment of Dh 5 million can be more capital intensive than an iron and steel rolling mill with an investment of Dh 400 million.

7.35 The preferred industrial structure, in UAE has to be based on a package of large, medium-sized and small industries. The imperative is not the size; it is low labour intensity and, as a reciprocal and an additional pre-requisite, high capital intensity. The several small units recommended for consideration for in-depth pre-investment studies in the present report are to be evaluated in this context.

Locational dispersal

7.36 With the limited population of UAE, there would not be much point in dispersed growth. The seven poles representing the seven capital cities of the Emirates, have been developing, as a matter of historical course with satellite industrial zones being planned around each of the centres.

7.37 When one, however, examines more objectively, in the context of industrial development anticipated, the new points developing at Al Ain, Ruweis, Khor Khwair, Mina Rashid, Jabel Ali, it appears that nothing will be lost in terms of 'external economies' of agglomeration. The dispersed growth, will prevent social disbenefits of concentrated industrial growth around major cities. In due course, these satellite poles, rising as major poles would lead to 'social economies'. It is the Team's view that this is a sound policy promoted by the different Emirates and should be pursued. The policy is supported by the fact that the UAE is not a country of major distances. Most of the development is taking place at port locations and these are easily accessible from other activity centres.

7.38 Nevertheless, there is a case for some kind of territorial division of labour among the various regions of UAE. This will ensure

- a) more orderly industrial development;
- b) prevention of waste of scarce resources;
- c) balanced socio-economic life;
- d) minimisation of avoidable instability in economic activity;
- e) avoidance of duplication of activity and unnecessary competition among the productive units in UAE itself;
- f) realisation of the possibility of larger units tending towards optimal sizes.

7.39 This does not imply that regional industrial development will be of an exclusive-type with concentration of specific industrial sub-sectors.

Concentration, however, of specified activities at one location permits provision of facilities more effectively and at a much lower cost. This has much relevance in regard to storage and repair and maintenance facilities.

Concept of industrial segregation

7.40 Owing to the peculiar factor-endowment pattern and the extraordinary requirements of industrialisation in UAE, it would be useful to consider segregated zones as centres of industrial activity.

7.41 The socio-economic problems of importing manpower can be mitigated by creating separate, segregated industrial zones so that the interactions with the local population and the demands that they make on the social services, may be minimised. The creation of segregated industrial zones with the necessary infra-structural facilities will also reduce the problems attendant on use of foreign capital and will enable more effective protection to environmental pollution.

7.42 Segregated industrial zones should be considered as areas in which capital, both from UAE and external sources in association with UAE, flows freely. Except for additional transportation cost involved in movement of goods, the industrial zones should be considered as if the locations exist in the preferred countries, developing or developed. The additional transportation cost could be compensated by favourable factors, such as cheap energy, inexpensive infra-structural facilities and negligible levels of taxation.

7.43 The concept of industrial segregation combines the characteristics of industrial estates/areas/parks and free trade zones. It is proposed, however, for UAE to serve an entirely different purpose, which is industrialisation of the country without imposing a large quantum of expatriate work force on the national life-pattern of the local citizens. While, therefore, the segregated areas will have the elements of industrial estates/areas and free trade zones, these will have to be designed and developed on a distinctive basis.

Basic criteria for project selection

7.44 It has been noted that the economic structure and operative characteristics of UAE present a unique model. Both the premium and discounting of the positive and negative factors have high values. The evaluation of new industrial investments demands a rather intricate,

complex and cautious process in order that positive factors may be liberally deployed and scarcer factors may be conserved. Although free enterprise can be very productive and should be encouraged to its maximal capabilities, nonetheless, the choice of investment projects will have to be made very discretely by a well-informed, vigilant planning machinery.

7.45 The role attached to the planning machinery need not imply that the decision-making process has to be centralised. What is needed is the rationale of evaluation of new investment projects being based on well-considered and uniform judgment. All projects should be subjected to this analysis in terms of value added criterion.

7.46 The industrial enterprises which have only marginal added value are not the types of investments that UAE can afford to promote. There is not much point, for example, in permitting an industry based on imported rolls of tissue paper to be cut and packed in cartons of imported paper. It is not unlikely that such enterprises are quite profitable since the exporters from the countries of origin charge high consumer prices on facial and toilet tissues. But it may not be unlikely also that the net profit retained by the UAE investor is no more than the profit an importer was making anyway. Why then invest in the entire super-structure of a factory along with concomitant problems?

7.47 Two further dimensions in regard to the evaluation of a project by value added criterion should be emphasised:

- a) the value added by manufacture alone should not be the guiding criterion: it should be the total value added by the activity including the contribution from the inputs-producing sectors;
- b) the added value attributable to foreign services should be excluded. These include profits shared by foreign capital and the royalty payments.

7.48 Value added by manufacture conventionally does not include (a) and (b). The share of (b) is ignored in any event in computing VA. The objective of employing VA as an indicator of net contribution to the economy is, however, different and possesses decisive significance in the UAE context. It should not be considered of theoretical importance only.

7.49 The process of evaluation should be applied in two stages, which are the project level and the national level. At the project level, the internal rate of return would remain the decisive index; but the project planners and promoters should be oriented to national evaluation parameters of social cost-benefit analysis. This will help even the investor, inasmuch as he would be sure that the right investment decision, from a long term point of view, has been made.

7.50 National economic parameters should consist of the premium and discounts which would need to be assigned to the benefits and costs of projects. Input/cost components, such as manpower and water, will be escalated in their values so that their use is discouraged to the maximum. On the other hand, the cost of surplus resources like capital, which can be liberally used, would be discounted.

7.51 It is the considered opinion of the Team that guidelines should be developed for the industrial planner, the project programmer and the investment evaluator. These guidelines are not meant to be deployed as tools of control for regulating economic activities. The guidelines are intended to be used as signals for direction and the yardsticks the evaluator/investor must use to make the right investment choices. The Ministry of Planning has a special role to play in developing the national parameters for evaluation of projects and in assigning the right priorities to new developmental expenditures within and between sectors.

7.52 It is recommended specifically that the Ministry of Planning should create a separate division for Project Planning and Evaluation. The major task of the division shall be as follows:

- a) to evolve and disseminate expertise on project planning and evaluation;
- b) to organise training programmes including workshops and seminars on project planning and evaluation;
- c) to identify the major social cost and benefit centres/ characteristics;
- d) to determine social parameters for evaluation of projects;
- e) to monitor if project planning and evaluation conform to the guidelines and parameters identified and developed.

The rationale of assistance to industry

7.53 On the question of assistance to and protection of domestic

industry, there are some valid doubts to be considered. It is argued that UAE already has a high income level and has no socio-economic problems such as unemployment and lack of foreign exchange to resolve: why is it then necessary to provide 'high cost' assistance at added expense to the community? When protection is extended, it unnecessarily raises the cost to the consumer. Since material inputs, manpower and expertise all have to be imported, selling prices of the final products may be higher than those of imports. Moreover, a domestic industry may not be able to supply the quality of goods needed. A protected industry may need to be protected forever, or over a long period. It may not become efficient and self-supporting.

7.54 The Team has, in the course of its investigations, been confronted with questions on the social and economic costs involved in the efforts being made towards industrialisation. These are valid issues for thorough investigation.

Inflow of foreign capital

7.55 It may appear paradoxical to suggest that foreign investment in industry should be welcome in UAE. It may sound like 'carrying coal to Newcastle'. A number of benefits would, however, flow from a two-directional flow of capital, from and to UAE. UAE has to depend a great deal on technology at fairly high sophisticated level. In the purchase of technical know-how, experience shows that one may not receive what exactly is required. Technical know-how is not a tangible product which can be seen and touched. Moreover, it is often defined in a jargon which is prone to different meanings and connotations.

7.56 The commitment of capital by the foreign lender of know-how or the supplier of equipment, would tend to ensure the supply of the right and pre-defined type of technology and developing know-how. It will also guarantee more effective application of the know-how, avoidance of breakdowns and introduction of developing technology.

7.57 This raises the problem of the limits to the inflow of foreign capital into UAE. The need for making a case for the inflow of capital itself implies that limits, in the form of a policy of "Dos and Don'ts", have to be clearly defined. A few guidelines are recommended in Chapter 13.

International cooperation

7.58 International cooperation is required for the development of industries in UAE

- a) products of which have only limited or negligible demand in UAE;
- b) the major inputs of which are substantially large in value and the sources of supply of which (i) are not accessible in the normal course of international markets; (ii) need further investments and development;
- c) which are highly competitive in the international markets;
- d) which employ high levels of specialised and sophisticated technologies and (i) the supply of which is not easily available, or (ii) the rate of obsolescence is high;
- e) which, because of complexity and dimensions of the operations, demand high management skills;
- f) which, because of magnitudes of investments and multiplicity of projects within the region, require intensive marketing efforts either for procurement of inputs or for the distribution of outputs;
- g) which, due to certain factor endowments, can be best developed with international linkage and not as integrated units within UAE.

CHAPTER 8

CRITERIA FOR IDENTIFICATION OF OPPORTUNITIES

Micro-level industrial approach

8.01 Industrial strategy at the micro-level has at least five distinct dimensions:

- a) approaches to selection of industrial growth opportunities with special reference to
 - i) material resource utilisation,
 - ii) size, direction and location of demand;
- b) technological choices and size structure;
- c) capital versus labour intensity;
- d) manpower composition — by levels of skills;
- e) international linkage;
- f) locational logistics;
- g) multiplier effects.

8.02 Some of the criteria are mutually complementary, for example, (b) to (d), but each one has a distinctive identity of its own. Not infrequently, these end up in conflicting decision-making choices. Utilisation of some material resources may lead to labour intensive industrial activity. An industry may have high multiplier effects but it may not be amenable to high technology. In another case, location of material inputs may be divergent from one of the markets; and the location preference by input or market may not be in conformity with locational logistics (such as dispersed growth).

8.03 It is necessary, therefore, to develop a matrix of different criteria with allocated weights. Since some of the criteria are non-quantifiable, it is not easy to make choices even when an appropriate matrix is developed. The problem of developing an index, which can aid directly in the investment decision-making, may be resolved by developing a consolidated coefficient or ranking scale. This scale should take into account factors, such as

- a) commercial profitability (like the Internal Rate of Return (ROI));

- b) social benefit-cost ratio;
- c) the realisation of economic objectives, such as
 - diversification,
 - self-reliance in significant areas,
 - protection of environment - or avoidance of pollution,
 - locational balance,
 - dependence on expatriate work force.

8.04 The evaluation of an index would need an in-depth macro-level study of economic goals and dynamics of UAE. This is obviously out of the scope of the present study, but one which should be undertaken at an appropriate stage by the planning authority. Major investment decisions should be subject to the matrix and the index to achieve the desired pattern of development and to prevent wasteful use of scarce resources.

8.05 The selection of and allocation of priorities to industrial investment opportunities/projects are based on similar but not necessarily uniform, criteria. While the nature of criteria remain the same, the emphasis, ranking and evaluation vary. In the case of identification, opportunities are located by their 'absolute' contribution; however, the selection is made by their relative contributions.

8.06 The selection of industrial opportunities for UAE ought to be based on a package of several considerations: a) technological, b) economic, c) social, d) environmental, and e) others.

8.07 Any investment decision-making on a national level has to be relative both within and between sectors. The emphasis and rankings shift to national criteria/benefits. The concern for environmental pollution, for example, is low in the case of the decision making by an individual investor; it is a matter of primary concern to the State. It also applies to the use of scarce resources. The investor is most concerned with his investment return.

Selection and priority criteria

8.08 A balanced industrial structure will call for allocation of appropriate weightages to different facets of varied industrial structure. An attempt has been made in the present exercise in identifying opportu-

ities to take cognisance of these facets, which broadly are the consumption, the input, the size, the technological and the production dimensions.

8.09 The strategy for allocating priorities for identification and selection of industrial opportunities adopted in the present study may be outlined briefly:

- a) the highest priority is assigned to industries which seek to utilise local resources and can be based viably on domestic demand which is presently being satisfied by imports;
- b) industries based on locally available or exploitable resources receive high priority even when there is no adequate domestic demand, and there are no preponderant cost factors which tend to make them less competitive against similar units in other countries which serve international markets;
- c) industries based on locally available or exploitable resources are given a fairly high priority even though domestic demand is not large enough to justify a capacity size which tends to make it internationally viable but which does not basically depend on international markets;
- d) industries which seek to substitute imports at total costs (direct production costs and other incidental costs such as social services) much below import prices(c.i.f.) receive a fairly high priority;
- e) high priority is assigned also to industries which are based on local resources and for which markets can be established in other countries by bilateral or multilateral long term agreements;
- f) a very low priority is given to industries which are based on or seek to export, directly or indirectly, scarce domestic resources. Food product industries based on agricultural products requiring large quantities of irrigation water, should, illustratively, be discouraged;
- g) industries with high GVA/manpower ratio are given high priority. The absolute numbers of size of labour force should not be a guiding indicator.

8.10 To satisfy other basic and significant criteria, an attempt should be made to select industrial opportunities by stages of production: it is, in other words, not necessary, to assign priorities to industries by the application of criteria to integrated units. One stage of production in a given industry may be a high priority area; the other or others low priority area/s.

8.11 Industries with the potential for export should be preferred notwithstanding the fact that earning/saving of foreign exchange is not an economic objective in UAE to strive for.

8.12 Despite the dictates of policy preferences, such as high capital intensity, it should be recognised by the planner, the policy formulator and the decision-maker, that some industries would grow spontaneously as a result of favourable market factors and attractions.

8.13 Bakeries, dairy products plants, soft drinks plants, must grow irrespective of economic logistics. Similarly, a water bottling plant (for domestic market), even if the product cost is high, represents an industrial activity which needs to be promoted. Sewage treatment plant also belongs to this category, which is directed mainly to the prudent disposal of the effluent — or prevention of environmental pollution. Other industries which fall in this group are refining of used motor and machine oils and a reclaim rubber plant, reprocessing the used tyres. These opportunities may seem to be too small for UAE; but these have a major social policy aspect — protection of the environment and should, therefore, be promoted, if necessary, subsidised.

8.14 An approach to identification of investment opportunities could be oriented by the delineation of possible markets:

- a) industries based on local markets, such as soft drinks, bakery products, bricks;
- b) industries based on the national market, such as building material aggregates, bottled water;
- c) industries based on the Gulf-wide market, such as refractory products, graphite electrodes, sheet glass, pelletised iron ore, PVC;
- d) industries based on global markets, such as major petrochemical intermediates, aluminium.

8.15 The division of industries by the market does not mean that these are exclusive. Some products meant primarily for the local market will be shipped to other areas. The wider market products, will, by definition, cover the smaller market areas.

8.16 It is easy to identify group (a) products. Industries in group (b) could be selected by the techniques of import substitution and resource utilisation. Group (c) and (d) would require more intensive

studies in regional cooperation. Obviously, investigations would have to be conducted in order to determine the regional activity in candidate projects and in the growth of the markets. In the case of group (d) products, extensive international demand studies will have to be launched by analysing present estimation of the market size, the past trends and future projections. These studies will analyse not merely demand dimensions, but also market characteristics and cost dynamics.

8.17 It would be found that in identifying opportunities, the import substitution approach has been adopted; this is, however, not actuated by the desire to minimise foreign exchange outflows (as is the case of many developing countries) but is a basic tool for the estimation of domestic demand.

8.15 It has been noted that a substantial part of the imports, specially from Dubai, find their way across the borders. This occurs in two ways:

- a) as a result of entrepôt trade;
- b) the expatriates working in UAE and their family members take substantial quantities of durables with them when they visit their respective countries; with negligible customs duties, UAE operates as "a free zone".

8.19 The re-export potential is a question. As analysed in other section of this report, the UAE re-exports, direct and indirect, constitute a very large share of its imports. These are the result mainly of two factors:

- a) UAE is a favourable location on the Gulf with two major ports having a large handling capacity; and
- b) with the near absence of import duties, the country serves as a free trade zone.

8.20 The question that emerges is whether one would permit the re-export demand to be served mainly by imports; or is it possible to substitute these imports. Obviously, the substitution will be viable only if the commodities of re-export can be produced at costs which are, comparable to import prices (that is, c.i.f. values). The risks of developing industries on the basis of import substitution to serve the demands of re-exports could be substantial. It will need to be ensured that the demands of the consuming countries are stable

and steady; that the countries are not likely to alter their import policies, and that the countries are not developing their own production facilities, which would, perhaps, be protected. In other words, large margins for the sensitivities of the markets will have to be built into the long term projections of demand.

8.21 Bulk imports of goods, for both domestic and re-export markets, would provide reasonable opportunities for blending, mixing, conversion and particularly packaging. In turn, these may be extended backward, as demands get inflated or when material inputs are domestically produced.

8.22 Export-oriented industries offer a very large potential in future. The present constraints — of materials, manpower and know-how — deter a bold approach on this front, but this direction offers the best hope to UAE's industrialisation programmes.

8.23 Translated in more concrete terms, the different approaches to identification of new industrial prospects in UAE could be grouped as follows:

- a) down-stream oil and gas-based basic and intermediate products industries intended primarily, in the immediate future, for international markets;
- b) third stage, down-stream petro-chemical industries producing basically industrial products;
- c) consumer goods industries based on oil and gas the feedstocks for which may presently be imported but which have the potential for production within UAE;
- d) energy-intensive industries;
- e) industries based on utilisation of natural resources being exploited or having the potential to be exploited;
- f) industries based on utilisation of wastes and by-products such as sulphur, sewage, used oils, discarded tyres, paper-cuttings;
- g) industries (import substitution type) based on domestic demands sufficient to provide 'economic size' capacities;
- h) industries which, as a matter of self-reliance, could be developed without much of economic disadvantage;
- i) ancillary and feeder industries serving large units or group of industries under other categories; and
- j) service industries, such as dry docks, maintenance workshops.

Divergent sub-sectoral strategies

8.24 The divergent resource bases, market horizons and sizes, technological factors, utility requirements, infra-structural constraints, manpower intensities, product life-spans, characterise the different industrial sub-sectors. Illustratively, technological considerations call for large plants for basic and intermediate petro-chemical products, for which the size of the demand in UAE at present is, and in near future will be, too small. Several building materials, however, are too heavy and because of the resource-base available, should be produced within UAE. There are some food products which are best produced locally either in raw material producing areas or in consumption centres. While petro-chemical industry has to be export-oriented, certain food products, however, ought not be exported even if commercially viable because of the utilisation of a scarce resource.

8.25 Different strategies, therefore, for identification, evaluation and policy choices for the subject industrial sectors have been designed. The sub-sectoral strategies of development, nevertheless, are woven together by common elements which should govern all industrial activity in UAE.

8.26 The present industrial survey has attempted to identify possible industrial investment opportunities in four principal areas:

- a) petro-chemicals;
- b) food industries;
- c) building materials industries;
- d) basic metals, metal working, engineering and electric goods industries.

Petro-chemicals

8.27 For practical purposes, the primary criteria are grouped under three aspects.

- process engineering
- production costs
- product selection

8.28 It should be emphasised that constraints upon markets and marketing are considered as having been received by appropriate cooperative arrangements.

8.29 Optimising along the lines of process engineering in the sub-sector calls for (a) minimum process steps, (b) large processing capacities. Optimising for production cost requires the unit production cost to show (a) high raw material and energy component, (b) high capital component, and (c) low labour component. Optimising for product selection requires large export potential with promising market penetration and shipment without major problems such as explosion, corrosion, but with high sales revenue or cash inflows.

8.30 Sub-ordinated to the basic criteria and in compliance with the stipulated option for diversification and build-up of a strong industrial infra-structure, supplementary criteria are introduced concerning the impact a project is likely to exert on the up-grading of materials, other than oil and gas, semi-finished products and by-products from the industry or the economy in general, while still maintaining consideration for export potential.

Food industries sector

8.31 The selection of food industries was based on locational criteria once it was established that there would be adequate demand and or resources for establishing viable production facilities.

8.32 A fairly large number of developmental opportunities have been recommended in the food industries sector. It has, therefore, been considered necessary to assign provisionally some priority preferences. It will bear repetition that projects selected will have to be tested by prefeasibility and comprehensive techno-economic feasibility studies. When such studies are undertaken, the results may call for re-drawing of the priority schedule. Both the selection of the programmes and the priorities indicated are provisional.

8.33 The priorities are governed, broadly speaking, by the following criteria:

a) High priority

- i) products for which there is an adequate demand and for which the principal raw materials are domestically available;

ii) essential products for which there is an adequate demand but for which the raw materials will have to be imported for quite some time.

b) Medium priority

i) products for which there is an adequate demand and for which the raw materials would be available in the near future;

ii) products which may not satisfy criterion (a) but have favourable secondary impacts on other activities;

iii) products for which the raw materials are locally available and the demand, although not adequate presently, is likely to grow to the desired level in course of time.

c) Low priority

not essential products for which an adequate demand exists but but for which the raw materials are not domestically available.

Building materials industries

8.34 The criteria for the selection of building materials industries are product-oriented and are outlined in Chapter 10. These take into account the specific needs of UAE construction industry, and the product economics.

8.35 The specific needs of UAE refer in particular to the increasing demand for better heat insulation, higher material and construction standards, longer life-span of buildings. The criteria governing product economics are related to shipping costs of inputs and outputs. The relevant characteristics are the cost as related to weight and wastage in the process of handling and shipping.

Basic metals and metal-working industries

8.36 In the case of basic metals, the major consideration has been to locate energy-intensive industrial opportunities since no metallic minerals have so far been discovered with commercial potential. In the metal-working, engineering and electrical goods group, a few opportunities only could be considered since the domestic demand is much too small. As a result of the growing market, UAE could offer some outlets for production of car parts and accessories, and some consumer durables including electronic goods. A more detailed

analysis has shown that the domestic market for most of the products is too small. Some opportunities had to be discarded because of their labour intensive character.

Opportunities in other sectors

8.37 The limitation of the identification in the four specified areas should not imply that there are no other opportunities outside these areas. In fact, more comprehensive analysis of the size of demand, domestic and international, and potential inter-linkage would unfold several additional opportunities even in the sectors examined. In any event, as the development proceeds, more possibilities would come to light. The investment opportunities proposed in this study and included in Chapters 9 to 12 for detailed consideration should be viewed in this context.

8.38 Illustratively, several salt-based industries, such as sodium chlorate and perchlorates could be considered for development in UAE. Both the major inputs, sodium chloride and energy, are available plentifully in the country. A sophisticated plant for the production of chlorate and perchlorates is capital-intensive with low labour content. The product will have a good potential for export and a capacity of 10,000 tons/year or more could be considered.

8.39 Demand for packaging materials will be very large with a high growth rate. The two packaging plants recommended by the UNIDO Industrial Survey Mission 1975 would, in full production, require at least 1.2 million cans, apart from cases, moisture-proof cellophane, vegetable parchment paper, polyethylene bags, waxed and fibreboard cartons. Some progress in the area has been made. A barrel and can manufacturing plant was inaugurated in Dubai in May 1978. The cement plant in Sharjah has set up a packaging plant as an ancillary unit. Another unit is being established by the Petroleum Department of Abu Dhabi. Several polythene bags units have sprung up creating a glut in the domestic market. And yet, because of the commercial activities and the attempts to import products in bulk, the demand for packaging materials would continue to rise and would need supporting production facilities.

8.40 To indicate the large dimensions of possibilities in the future in pursuance of the targets envisaged under the present exercise for the manufacturing sector, a few possible milestones for future consideration are shown:

	Projected capacities in tons		
	1985	1990	2000
Oil refining	10,000,000	20,000,000	40,000,000
Ethylene	200,000	400,000	600,000
Fertilizers(nitrogen)	500,000	750,000	1,500,000
Synthetic rubbers	50,000	100,000	200,000
Aluminium	500,000	750,000	1,200,000
Sponge iron	1,500,000	2,500,000	4,000,000

8.41 Although the caution has been used earlier in indicating the potential, it would bear repetition that the quantities are purely indicative and would not be viable unless appropriate international marketing arrangements are concluded.

CHAPTER 9

PETRO-CHEMICAL INDUSTRY

Global profile

9.01 A unique characteristic of the petro-chemical industry is its dual dependence on fossil fuels as a feedstock and as an energy source. The two uses draw presently some 4.3 and 1.0 per cent respectively of the consolidated petroleum and gas production.

9.02 Petro-chemicals constitute some 90 per cent of the organic chemical sector and for over 50 per cent of the total chemical industry. The chemical industry is a major consumer of intermediates in the industrial sector.

9.03 The consolidated utilisation of petroleum and gas for petro-chemical purposes varies from 15 per cent in Japan, 12 per cent in Western Europe and 6 per cent in North American and East European countries to only 2 per cent in others.

9.04 With the enormous resources of petroleum and gas and particularly no utilisation of the fossil fuels by the chemical industry in UAE, the prospects for petro-chemical industry subject to market and technological availability, to put it modestly, are large.

9.05 The production of petro-chemicals (a dozen basic and over 200 intermediates) involves sophisticated continually developing proprietary technologies. Some of these technologies are generally available; others are subject to arrangements.

9.06 Present world production of the more outstanding basic petro-chemicals is as follows:

	<u>Million tons</u>
Ethylene	26.0
Propylene	13.7
Butadiene	4.9
Benzene	13.3

9.07 Ammonia is primarily absorbed by the fertilizer industry. In an economy as diversified as that of the USA, some 10 per cent of the total ammonia produced is upgraded to petro-chemical end-products finding their outlets mainly in the plastics and fibre industries.

9.08 The world production of final petro-chemicals, grouped according to their end-uses, in 1975 was of the following orders:

	<u>Million tons</u>
Plastics	38.5
Synthetic fibres	7.5
Rubbers	7.4
Detergents	10.8

9.09 A considerably smaller tonnage of final petro-chemicals accounts for speciality chemicals such as antioxidants, stabilisers, softeners, other additives.

9.10 The rapid growth of the industry can be adjudged from the fact that the corrected value of projects under construction had increased in 1976 as compared to the preceeding year: in Western Asia by 76%, in Latin America by 43%, in Eastern Europe by 36%, in South East Asia by 30%, in Western Europe by 29% and in North America by 11%.

9.11 The consolidated increased share in world production of developing countries is estimated to grow, by 1985, along the following pattern:

Basic petro-chemicals	16%
Plastics	20%
Synthetic fibres	23%
Synthetic rubbers	13%

9.12 The development by the investment dimension of the petro-chemical industry may be appraised by the following estimated investment magnitudes:

	<u>Upto 1980</u> <u>US\$ billion</u>	<u>1985</u> <u>US\$ billion</u>
Total world	<u>55.0</u>	<u>108.4</u>
of which		
Middle East	2.2	5.7
Western Europe	6.4	14.9
Eastern Europe	6.7	13.2
North America	12.8	27.2
Japan	4.9	8.1

9.13 The global manpower requirements for the petro-chemical industries are projected to be of about 1.3 million in 1985, of which the United States and Europe would take 25 to 33 per cent respectively. The manpower distribution in the petro-chemical industry appears to follow typically the following pattern:

Technical	20
Administration	2
Sales	1

9.14 On the foregoing basis, the manpower requirements in the Middle East outside Africa are estimated as follows:

Technical	26,900
Administrative	2,700
Sales	<u>1,300</u>
Total:	<u>30,900</u>

9.15 The projections for petro-chemical industry were based on three hypotheses:

Hypothesis A : based on a simplified model developed by UNIDO to assess the implications of the time target;

Hypothesis B : reflecting Professor Leontief's study on "The Future of the World Economy " ;

Hypothesis C : conforming with the assessment of different business organisations, in particular with the one by the Cavendish Laboratory (UK).

9.16 The estimates of global development of petro-chemical industry for the year 2000 are set out in Table 9.01.

9.17 In the year 2000, the share of the developing countries in global production of petro-chemicals is expected to reach 18 per cent by hypothesis B and C; but it will exceed one-third (35%) under UNIDO projections. Their relative shares in total world investment would be of the following order:

Hypothesis	Investment US \$(1977) billion	Relative global share (%)
A	248.6	44.4
B	189.1	27.5
C	122.6	22.9

Petro-chemicals in the Gulf region

9.18 With the exception of Iran and Iraq, which possess abundant raw materials and relatively large populations, the other States bordering the Gulf, Kuwait, Saudi Arabia, Bahrain, Qatar and the United Arab Emirates have

TABLE 9.01

PROJECTIONS OF GLOBAL DEVELOPMENT OF PETRO-CHEMICAL INDUSTRY, 2000

C H A R A C T E R I S T I C S		Hypothesis A ^{a/}	Hypothesis B ^{a/}	Hypothesis C ^{a/}
A. Basics				
GDP growth rate	% p.a.	4.0	4.8	4.0
Energy consumption	TOE billion ^{b/}	13.6	15.27	13.3
Oil consumption	TOE billion	5.5	6.53	4.5
B. Petro-chemicals				
Feedstock and energy use	TOE billion	0.8	0.95	0.8
Demand				
Synthetic fibres	Million tons	45.6	51.1	42.4
Plastics	Million tons	192.5	243.6	197.6
Synthetic rubbers	Million tons	24.5	29.2	25.4
Investment requirements	US\$ billion	559.5	688.5	534.4
Manpower requirements	Million workers	3.3	3.9	3.2

a/ For sources see paragraphs 9.15 to 9.17.

b/ TOE = tons oil equivalent.

raw materials but are characterised by small populations.

9.19 Iran, the area's oldest established oil producer, with an expected population of 40 million around 1980, has the most extensive and diversified programme for the petro-chemical industry, although the plans set up in years following the events on the oil market in October 1973, have since been somewhat curtailed.

9.20 Iraq is making an all out effort for the collection and utilisation of associated natural gas. Ethane and other fractions are earmarked for ethylene and methane for ammonia/urea.

9.21 The three States, Kuwait, Saudi Arabia and Qatar, have concentrated on maximising the potential resources of associated gas. Kuwait and, on an even larger scale, Saudi Arabia, have initiated, some ambitious programmes.

Economics of petro-chemical projects

9.22 The costs of petro-chemical feedstocks is directly related to the expected profits on the transfer price of gas. For evaluation of projects in this area, therefore, opportunity costs of gas should be considered. For illustrating the incidence of the cost of feedstock on product costs, an illustrative case based on gas may be given.

9.23 The cost of producing one ton of ammonia in 1976, at the rate of 1,000 tons/day, was as follows:

	<u>Pound sterling</u>	<u>Percentage of total</u>
Gas	37.20	42.26
Other variable costs */	1.40	1.59
Fixed costs	10.54	11.97
Depreciation	12.96	14.72
Return on investment	<u>25.93</u>	<u>29.46</u>
Total cost	88.03	100.00

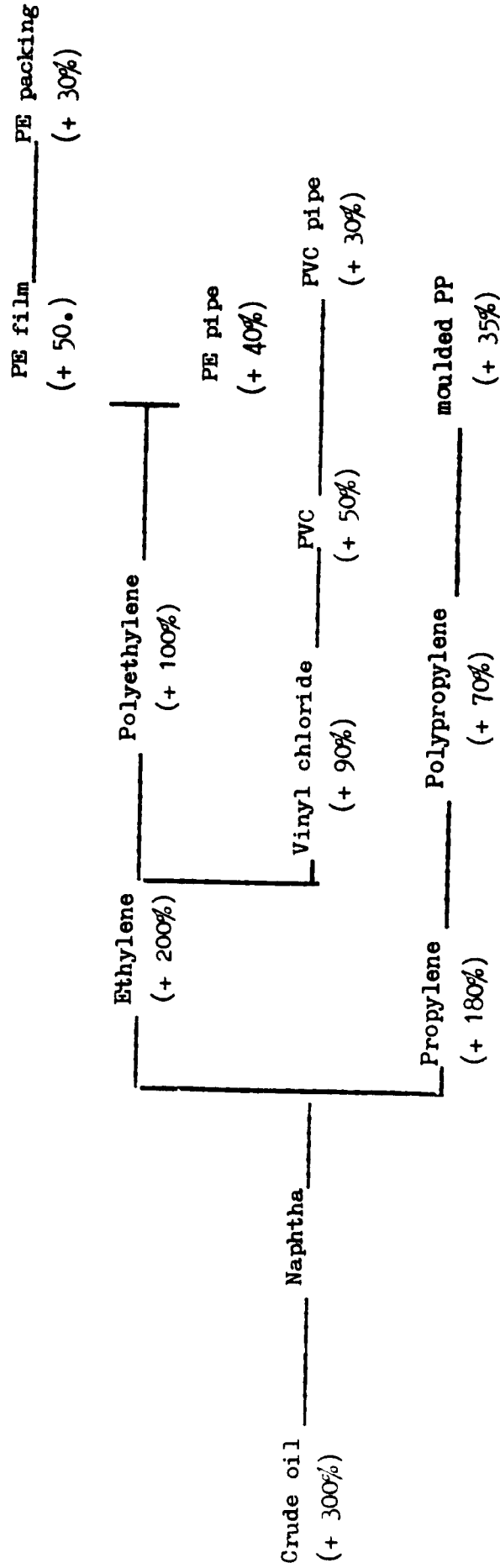
* Feedstock and fuel not included.

9.24 The impact of crude oil cost increase on the cost of a selected number of petro-chemicals, basic, intermediates and end-products, is illustrated in Exhibit 9.01.

EXHIBIT 9.01

IMPACT OF CRUDE OIL COST INCREASE DURING JUNE 1973 & JUNE 1974

ON COST OF PETRO-CHEMICAL PRODUCTS



Naphtha price is dependent on specific market conditions and may vary independently of the crude oil price. During the considered period, the naphtha price increase amounted to 400%.

9.25 As for utilities, a petro-chemical complex will be self-supporting by basing it on a modern "total energy" design with the aim of optimising costs by appropriately integrating all unit operations involved.

9.26 The application of a location factor of 1.6 to 1.7 to the erected plant cost in United States Gulf Coast has been assessed as realistic for UAE. Rigorous planning and favourable techniques may help the capital costs to be kept at a lower level.

Domestic and foreign markets

9.27 Due to the economics of size, large capacities are required for most petro-chemical plants that will need export outlets. Channeling a fraction of the output into the local economy for further processing would be possible. This implies that any forward downstream activity will be conditioned by the export potential. This export potential is, to some extent, influenced in turn by similar priorities in the neighbouring Gulf States.

9.28 The introduction of large quantities of petro-chemicals on the world market would call for utilisation of the established marketing channels of collaborating companies or other international trading firms. Presently, the global markets of most petro-chemical projects have been witnessing sluggish growth with industrial capacity operating at only 70 to 80 per cent, and in certain cases, even as low as 60 per cent. This position is accentuated by protectionist trends adopted by several countries.

9.29 Considering that the gestation period — dream to stream stages— of larger petro-chemical projects, is 5 to 8 years, the present depressed state of the market should not preclude medium/long term planning of new projects for coping with the developing situation. Moreover, it is also possible to evolve backward integration by starting consumer user industries in the beginning, and intermediate and basic petro-chemicals later.

9.30 The present indications of development seem to suggest that the Middle East will improve appreciably. its share and there are reasons that UAE should claim its rightful role in both the Middle East and global markets. This share should conform to the large oil and capital resources of UAE.

Technology know-how and equipment

9.31 The know-how concerned with the establishment of a petro-chemical industry is conveniently grouped under two aspects:

- a) know-how generally available in terms of general technical capability transferred through education, information, exchange and training;
- b) proprietary know-how, accessible through licensing.

9.32 While the transfer of technical capabilities represents a constraint, the acquisition of proprietary know-how, that is, licences and patents, is a commercial transaction and should normally be accessible at a given price. In the petro-chemical area, it often carries numerous restrictions, prohibitions and conditions which may, in some cases, be tantamount to non-availability.

9.33 The procurement of sophisticated process equipment for the petro-chemical industry involves expertise for the correct selection and evaluation and, therefore, calls for high level manpower capabilities. UAE will have, for quite sometime, to employ external consultants and expatriate personnel in this area. The technical assistance from international agencies like UNIDO can be sought. The same consideration applies, even more, to the selection of the most appropriate technology.

9.34 The manpower requirements for petro-chemical facilities are the following:

Technical personnel:	87%
- engineers and managerial staff	3%
- foremen and technicians	10%
- skilled workmen	45%
- unskilled workmen	29%
Administrative personnel:	9%
- managerial staff	2%
- clerks	7%
Sales and marketing personnel:	4%
- managerial staff	2%
- clerks	2%

Petro-chemicals in UAE

9.35 Because of its limited capacity (15,000 b/d) the refinery at Umm al Nar, operating since 1976, is not a source for petro-chemical feedstock.*

* Oil and gas as input resource discussed in Chapter 2.

Refinery sources for feedstock could, however, become available from about 1980 onward when the new 120,000 b/d refinery at Ruweis is scheduled to start production.

9.36 Off-shore associated gas has been processed since 1976 on Das Island. The annual production is 2 million tons of LNG and 8000,000 tons of LPG, which will be exported to Japan for the next 25 years.

9.37 The 185,000 b/d of NGL, which will be extracted from onshore associated gas plant at Ruweis, scheduled for start-up in approximately three years, would provide feedstock for a liquid- and gas-based petrochemical industry.

9.38 Another gas project with interesting possibilities is the plant at Jebel Ali (Dubai) now under construction. From 1981 it is scheduled to produce yearly 135,000 tons of gas for local use; and 371,000 tons of propane, 261,000 tons of butane and 2,300,000 million barrels of condensate for export.

9.39 The few establishments presently operating in the petro-chemical sector are concerned with the production of plastics goods (pipes and miscellaneous products including polythene bags) and with formulating commercial brands of detergents. These are based on imported materials because the quantities required of the raw materials are too small to permit economic-sized production in the country in the near future. Five projects for ammonia, ethylene, urea, methanol and polyethylene, are under consideration by Abu Dhabi National Oil Company. It is realized that there may be other related studies in UAE either in preparation or terminated. With the large interests involved, the cost of the type of projects being in the nine to ten digit range (US \$), there is reluctance to disclose advance information.

Potential projects

9.40 In accordance with the criteria for identification, resources and infra-structural base, the potential investment opportunities in the UAE are enumerated in the Table 9.02. The order in which they are enumerated expresses, within certain limits, the relative degree of priority attached to them by the Team.

TABLE 9.02

POTENTIAL PETRO-CHEMICAL PROJECTS

<u>Product</u>	<u>Based on</u>	<u>Outlets</u>
A. <u>Projects Satisfying Basic Criteria</u>		
1. Carbon black	Methane, lubeoil extracts, pyrolysis, tar.	Exports and/or tyre manufacture for export
2. Ammonia	Methane	Export and/or urea production for export
3. Ethylene	Ethane	Export and/or PE for export
4. Carbon disulphide	Methane and sulphur	Export and small amount for pesticides
5. Urea	Ammonia	Export
6. Methanol	Methane	Export
7. Polyethylene	Ethylene	Export and small amount for local use
B. <u>Projects Satisfying Supplementary Criteria</u>		
8. Automobile tyres	Guayule rubber, carbon black, sulphur.	Export, some locally
9. Petroleum coke	Heavy fuel oil from refinery	Graphite production
10. Graphite	Petroleum coke	Graphite electrodes for aluminium smelters, export, some local
11. Lubeoil base stocks	Refinery streams	Use in new lubeoil blending plant in Dubai and proposed plant in Abu Dhabi and for export
C. <u>Project in Associated Area with Extended Relevance</u>		
12. Natural rubber	Guayule shrub	Tyres and other rubber products

9.41 The following projects qualify for further action:

a) projects satisfying basic criteria:

carbon black
carbon disulphide;

b) other projects:

lubeoil base stocks
graphite electrodes
natural rubber (Guayule), a precursor for automobile tyres
petroleum coke.

9.42 Carbon black and natural Guayule rubber are primary inputs for the tyre production which also would use some sulphur.

9.43 Carbon disulphide, besides providing export opportunities, could be upgraded locally with the use of some ammonia and provide a base for local formulation of pesticides.

9.44 Lubeoil base stock produced in UAE could provide an attractive input for the new lubeoil blending plant in Dubai and the proposed plant in Abu Dhabi while aromatic extracts — a valuable by-product from lubeoil production — could serve as additional feedstock component for the production of carbon black.

Project for carbon black

9.45 The principal characteristics of this project are in conformity with the criteria of minimum labour force, maximum utilisation of local raw materials and high cash flow generation.

9.46 Present world prices for carbon black, high abrasion quality, excepting special contract conditions, are as follows:

<u>USA</u> <u>(cents/lb)</u>	<u>FRANCE</u> <u>(F/kg)</u>	<u>FRG</u> <u>(DM/kg)</u>	<u>ITALY</u> <u>(Lit/kg)</u>	<u>UK</u> <u>(£/100 kg)</u>
11.50	1.79	0.85	317	23.10

9.47 Comparing present ammonia prices in the USA at \$85 to \$87 per ton, the sales revenue from carbon black under United States and West German conditions are about three and five times higher respectively.

9.48 Methane is both feedstock and energy source, and no other materials are required. The amount of gas used for producing one weight unit of carbon

black varies somewhat with the method used and the composition of the gas. Generally, up to 60 per cent of the carbon content of the feedstock is recovered as product. Methane feedstock can be supplemented by aromatic extracts from lubeoil production or by pyrolysis tar from naphtha crackers.

9.49 The cost of a plant (US Gulf Coast basis) with a capacity of 50,000 tons/year is estimated to be in the order of Dh230 million,^{*} with a size factor of 0.7.

9.50 The cost of know-how to be added would be a matter of negotiations and depend on the arrangements concerning the corporate structure of such a venture.

9.51 For operation, maintenance and supervision at the above rate and under US conditions 0.7 manhours are required per ton of product.

9.52 The main utilisation of carbon black is in the rubber tyre industry. The importance of this outlet results from 30 to 35 per cent of the rubber of a tyre.

9.53 The process for making carbon black is based on the partial pyrolysis of natural gas and oils rich in aromatic hydrocarbons, and then collecting the product on cooled surfaces.

9.54 The world production of carbon black is estimated to exceed 2 million tons per year. Pelletized carbon black is shipped in bulk hopper cars or automatically packed in 50-lb three-ply kraft paper valve-type bags.

9.55 Phillips Chemical Company, Continental Carbon Company and Cabot Corporation are leading sources of know-how in the USA. Licences are available.

Project for carbon disulphide

9.56 The main utilisation of carbon disulphide is for the production of regenerated cellulose rayon and cellophane, which absorb over 80 per cent of the total production. Thanks to its qualities, which include toxicity to insects, fungi, nematodes and rodents, carbon disulphide is also used as a fumigant and is particularly effective in killing weevils the small beetles feeding on and infesting stores of grain, nuts and other seeds and responsible for heavy storage losses. Its high volatility makes disposal of any excess very simple. Other uses are in freeing oil

^{*}/ Gulf coast capital cost basis converted by application of locational conversion cost factor and the prevailing exchange rate.

wells from sulphur, wax and iron sulphide through direct injection, as solvent for stains and in the manufacture of matches. By reaction with ammonia, thio-carbamates are produced which are used as rubber accelerators and serve in the formulation of powerful insecticides and fungicides.

9.57 The principal features of this project are in conformity with the criteria of minimum labour, maximum local material consumption and maximum cash inflow. The product contains 84.2 per cent of sulphur. The production is aimed at reducing the sulphur mountain, which is expected to grow by about one million tons a year from 1980 onwards as a result of the gas washing operations.

9.58 Present world prices for carbon disulphide, excepting special contract conditions, are:

<u>USA</u> <u>(cents/lb)</u>	<u>FRANCE</u> <u>(F/kg)</u>	<u>FRG</u> <u>(DM/kg)</u>	<u>ITALY</u> <u>(Lit/kg)</u>
27.10	0.97	0.58	190

The market value of carbon disulphide compared to that of ammonia, under the present conditions in the USA and the FRG, represents a ratio of 5:1 and 6:1 respectively.

9.59 Feedstocks for carbon disulphide production are methane and sulphur, both of which are waste products under present conditions.

9.60 The catalyst required is relatively inexpensive activated alumina or synthetic clay. The yield is 85 per cent on methane and 90 per cent on sulphur. Energy consumption per ton of product is around 150 kWh.

9.61 The cost of a plant (US Gulf Coast basis) producing 50,000 tons of carbon disulphide per year is estimated to be in the order of Dh 375 million.* The size factor is 0.78. Know-how is not included and is negotiable according to the type of cooperation with the licensor. The manhours required under US conditions are 0.60 per ton, for operation, maintenance and supervision.

9.62 In 1970, five US manufacturers (Allied Chemicals, FMC, Penwalt, Pittsburg Plate Glass, and Stauffer) produced 721 million lb of carbon disulphide. The price was 4 cents/lb against the present price of 27 cents/lb.

*/ See footnote on page 131.

9.63 Earlier, carbon disulphide was made from sulphur and charcoal. In the process now used, vaporized sulphur is reacted with methane under slightly elevated pressure. Unreacted sulphur is removed from the reaction gases by scrubbing with liquid sulphur and crude carbon disulphide is separated by absorption in a hydrocarbon solvent. The off-gases from the absorber are treated for sulphur recovery.

9.64 The stripped carbon disulphide product, a liquid heavier than water, is stored and shipped in steel tank cars or steel drums under a blanket of water to minimise evaporation.

Project for petroleum coke

9.65 The project characteristics comply with the criteria of upgrading of material other than oil or gas, semi-finished products, and by-products from the industry or the economy in general, while still maintaining the weight on the export potential.

9.66 Petroleum coke is considered here primarily as a precursor for the production of graphite and graphite electrodes as used in the chlor-alkali and the aluminium industry.

9.67 The anticipated end-users would include the Jebel Ali aluminium plant (Dubai) expected to come on stream in 1979, the one proposed for Abu Dhabi, and existing plant operating in Bahrain and another under advance planning in Saudi Arabia. Other Gulf countries have similar projects which could be potential users. The only other graphite electrode project in the Gulf region is in Iran.

9.68 Petroleum coke is made from reduced crudes, cracked tars and heavy vacuum residues by thermal cracking. Depending on the feedstock, some 30 to 40 per cent of coke and 10 to 15 per cent of gas are produced. The balance is gasoline, naphtha and gas oil. Two processes are available: delayed coking and fluid coking.

9.69 In delayed coking, the feed is heated in a pipe-still to around 490°C and then transferred to a system of coke drums alternately filled and emptied. The coke is removed by mechanical means. In fluid coking the coke is discharged continuously in the form of granules. Manhour requirements for fluid coking are lower, approximately half of those for delayed coking. Under UAE conditions, fluid coking should be preferable.

9.70 The cost for a 10,000 barrels/day fluid coker is estimated to be in the order of Dh 107 million, with the related size factor being 0.42. The capacity of 10,000 barrels/day is taken merely for the record of illustrating the various related data, and therefore, does not imply a recommendation for the optimal capacity which could be ascertained only by detailed studies to follow. The capacity of 10,000 barrels/day would be equivalent to 429 tons/day of "green coke", containing some 10 to 15 per cent of volatile matter. The green coke is calcined to produce approximately 138,000 tons/year of dry coke.

9.71 At that rate, 0.015 manhours would be required per barrel of throughput. Power, steam and water consumption per barrel of throughput, would be 0.06 kWh, 2.25 lb/h, and 0.64 US gallons/minute, respectively.

9.72 Not every type of coke is suitable for all the potential outlets. A laboratory or pilot test is, therefore, required when the product is intended for some specific purpose.

Project for lubeoil base stocks

9.73 A potential project for production of lubeoil base stocks qualifies identified criteria for further studies. With a rated capacity of 250,000 barrels per year (single shift) it could provide feedstock for the new lubeoil blending plant in Dubai commissioned in May 1978, and another planned for Abu Dhabi.

9.74 With the output of one single shift largely exceeding the needs in the UAE, full three-shift operation would correspond to upgrading the aliquot part of crude oil for export, including a certain promising backward integration.

9.75 Lubeoil base stocks are usually produced by the following three operations preceded by vacuum distillation: (a) propane deasphalting, (b) furfural extraction and (c) MEK dewaxing. Licensing is usually available.

9.76 The lubeoil base stocks are blended to specification using appropriate additives. These are marketed according to commercial standard types.

9.77 A by-product from the furfural extraction step is the aromatic extract, a valuable additional feedstock for carbon black production.

9.78 Lubeoil is the refinery product with the highest value added. Its production involves the most specialised know-how of refinery operations in general with the related quality control requiring highly sophisticated equipment and knowledge for interpreting test results.

9.79 Lubeoil production and lubeoil blending can be integrated into one complex or built separately, with the former generally forming part of a petroleum refinery, and the latter constituting a separate operation. Investment and operating, transport and marketing costs vary accordingly and are subject to investors' decisions based on detailed studies.

Natural rubber from Guayule shrub

9.80 The production of natural rubber, for which presently the tropical Hevea plant is responsible, will by 1980 show a growth rate of some 4 per cent only, while demand is estimated to increase by that time at the rate of 6 to 7 per cent a year.

9.81 The maintenance-free desert plant Guayule, a relative of the sunflower, could not only avert a natural rubber crisis, but also have good prospects to take over a substantial market share of the synthetic rubber, in particular, polyisoprene.

9.82 Guayule rubber, like Hevea is, chemically speaking, nearly identical to synthetic polyisoprene, which for its various advantages, commands a premium of some 30 per cent over the price of common SBR (styrene-butadiene rubber).

9.83 Guayule rubber can be said to combine the favourable qualities of Hevea rubber with those of synthetic polyisoprene. It exhibits the advantage of natural rubber in "hot tear" strength over synthetic polyisoprene, qualifying thereby for radial and large truck tires at the same time being easily masticated before manufacture, a quality for which polyisoprene is appreciated.

9.84 Uncultivated Guayule is a maintenance-free plant, exploitation of which can be economically feasible. Harvesting can be effected mechanically by cutting off the plants just above the roots, or by collecting them roots and all.

9.85 The latex obtained from the Guayule plants is masticated, purified and blended with fillers (carbon black, in proportion 2 to 1) sulphur, or carbon disulphide for vulcanization and various modifiers like plasticizers, softeners, antioxidants and pigments.

9.86 Around 1910, half of the rubber used in the USA was extracted from uncultivated Guayule plants and treated in rubber mills located in Mexico and Texas. This activity came to an end through depletion caused by reckless exploitation without replanting and through political events in the area.

9.87 A second vogue of Guayule rubber was initiated in the USA following the developments of World War II in the South-East Asia area, but eventually supplanted by the synthetic rubber of the SBR (styrene-butadiene) type of rubber.

9.88 At present, Mexico only is engaged in the development of the Guayule rubber, with a pilot tyre factory which is planned to be extended to the equivalent of 30,000 tons of rubber a year. An important aspect, besides the commercial profitability of producing Guayule rubber, are the national benefits derived from the reclamation of desert land.

Specific follow-up for projects

9.89 For the carbon black project, detailed feasibility and market study should be undertaken and efforts should be made for the identification of potential partners for the supply of know-how and cooperation in marketing. In view of the possibility to utilise locally produced carbon black in conjunction with natural Guayule rubber for production of tyres, the proposed study should include all related aspects.

9.90 Recognizing the manifold qualities of carbon disulphide, the feasibility study recommended for this outstanding chemical should be on down-stream uses, including the production of powerful pesticides under licence of a specialized company.

9.91 In order to get the studies on Guayule rubber under way, it is possible to make an arrangement with an international agency like UNIDO for making the necessary arrangements with the Mexican authorities for receiving a fact-finding mission from the UAE. A study on the viability

of growing the shrub for purposes of production of rubber in adequate and commercial quantities should be made, possibly with the assistance of the United Nations Food and Agricultural Organisation (FAO).

9.92 If and when the decision is taken to proceed with the planting of Guayule shrubs in the UAE, preliminary studies on the feasibility of erecting a tyre factory should be initiated.

9.93 The first step to be undertaken in regard to petroleum coke with the production of graphite and graphite electrodes should concern the selection of a potential supplier of know-how and testing for identification of the right type of the coke.

9.94 With the suitability of the coke confirmed, detailed feasibility studies should be started to secure the cooperation on the establishment of the related facilities and marketing.

9.95 The production of lubeoil base stock for eventual blending to commercial brands calls for an agreement amongst the parties concerned to proceed with the implementation, subject to the optimized combination of design, the logistics of supply, captive use and marketing.

9.96 Considering the constraints exerted upon a number of project inputs by limited manpower qualified to act as "receivers" in the transfer of know-how operation, the establishing and implementation of a plan for intensive training of personnel in all pertinent functions and on all levels should receive top priority.

9.97 Existing training activities should be ascertained in detail and appropriately built into the programme. Such activities would include AINOC's reported provision for sending UAE students to foreign universities and plant operators to, for example, Al-Nasr Petroleum Company in Alexandria, and ADMA-OPCO/ADGLC Training Centre with possible extension in other countries.

9.98 Front line activities like project evaluation and programming and project engineering and management, should be strengthened through seminars to be held in the UAE with the cooperation of guest lecturers of high international renown. Such operations could be envisaged to be extended to permanent study and training centre for the UAE in close liaison with similar activities in the Gulf area. International organisations such as UNIDO could be instrumental in setting up such an institution.

CHAPTER 10

BUILDING MATERIALS INDUSTRY

The building boom

- 10.01 The construction industry taken as a whole, including building and civil engineering works and materials industry, has been a leading economic activity in the UAE since the formation of the federation.
- 10.02 Due to the unprecedented building boom during the early 1970s, specially in Abu Dhabi, Dubai and Sharjah, the building activity almost doubled during certain years. What is seen today was created virtually out of nothing a decade ago.
- 10.03 The contribution of the construction industry (excluding the manufacturing sector of building materials industry) to GDP, at current prices, expanded from Dh 394 million in 1972 to approximately Dh 1,000 million in 1974. The year 1975 saw the crossing of the Dh 2,200 million mark. For the year 1977, the provisional estimates put the figure at almost Dh 5,000 million. In other words, in a five-year period between 1973 and 1977 (excluding the low base level of 1972), the building activity, in terms of monetary value, expanded over nine times.
- 10.04 The Emirates of Abu Dhabi and Dubai were responsible for more than 90 per cent of the construction expenditures. In 1970, the total construction expenditures reached Dh 3,000 million in a country with a population of around 640,000, of which only 215,000 were UAE nationals.
- 10.05 Under the stresses of the abnormal conditions of the boom of the 1973-1977 period, there is no wonder that the building activity did not follow any disciplined growth process and the year 1977 saw the signs of a perceptible slow-down. During the period, neither planning nor technology were able to keep pace with the speed of activity. Building codes and regulations have become out-of-date and, in some cases, are non-existent. The building administration is based generally on foreign tradition with insufficient technological content.
- 10.06 In March 1977, Batelle, a Swiss research institute, published "International Forecasts for the Construction Industry, UAE". This report was critical of many aspects of construction in UAE and stated that the market situation was unhealthy. It foresaw the peak of the boom in construction to be followed by a declining trend starting in 1977.

10.07 In the context of the basic conditions under which the construction activity has operated, a welcome phenomenon is the relatively high level of town-planning. The cities, which have emerged in a short span, present a facade which is pleasing to the eye and functional to the city-dweller.

10.08 The construction boom is limited not merely to the building activity. The public works programme has been equally impressive, whether it be the roads, the drainage system, the water supply and other public utilities, such as the ports and airports, or the communications system. Although a brake has been put on new projects to be sanctioned in the current fiscal year, the programmes in the pipeline are sufficient, notwithstanding the slow-down, to keep the pace of construction activity fast.

10.09 An idea of the building activity at the state level may be obtainable from the budgetary expenditures. The 1973 Budget of the Emirate of Abu Dhabi provided for an expenditure of Dh 451 million for housing and Dh 589 million for public buildings, both aggregating to Dh 1,040 million out of a total budget estimate of 6,000 million. The expenditures of other Emirates, and specially of Dubai are also large.

10.10 Most building materials are imported; and where local materials are used, like gravel, sand and cement (manufactured or imported), these are of a type which do not conform to the salt and sulphur content of the aggregates required. Education and practical training in the associated professions are at a very low level and no facilities for medium level engineers and architects exist.

10.11 The performance of the newly established, rather big, highly mechanised industries making cement, concrete blocks and sand lime bricks, is generally satisfactory. This is not always the case with the smaller concrete block producing and other units.

Demand projections

10.12 The demand size for building materials need to be evaluated under two sets of conditions:

- a) status quo in building standards; and
- b) improved construction materials, designs and techniques.

10.13 For estimating the demand of the materials, the following methods were considered:

- a) extrapolation of the past trend;
- b) comparison with norms of demand in developed countries;
- c) demand survey combined with indicator method; and
- d) analysis based on improved conditions of the construction industry.

10.14 The extrapolation method is inappropriate since the past trends have been abnormal. The reference data of more developed countries could be used with necessary modification for identifying certain norms but those are inapplicable as a package to the objective conditions in UAE. In the determination of the present and future demand, a mix of (c) and (d) have been used.

10.15 National households were estimated at 41,600 in 1976, of which 30 per cent had satisfactory housing, 20 per cent needed housing improvement and 50 per cent expected a new house.

10.16 Considering the expected rise in population, the improvement in living standards, and, therefore, in housing standards including better conditions for housing of the expatriate work force, it is estimated that 9,000 to 13,000 building units will be constructed for nationals and 2,000 to 2,500 units for expatriates every year. The latter figure may need upgrading since many expatriate workers live under extremely unsatisfactory housing conditions.

10.17 The choice for type of accommodation has a direct relevance to the demand for building materials. In the international debate, the preference is crystallising on the "low-dense" concept against "high rise" and villa-type units.

10.13 The building activity in UAE is projected to be of the following size in the coming years:

	Estimated range (Thousand m ²)	
	<u>Min.</u>	<u>Max.</u>
Housing	900	1,360
Social service institutions and public administration	65	120
Commercial buildings	35	55
Industrial plants	200	250
Others	<u>20</u>	<u>35</u>
TOTAL	<u>1,220</u>	<u>1,820</u>

10.19 It is projected that the lower range limits will be the order in the early period with the higher limits being reached towards the end of the century. The estimates include the replacement requirements.

10.20 The hotel building boom is expected to reach a peak this year or next year. In Dubai, hotels with a capacity of 1,365 rooms were operating in 1978. In Sharjah, the corresponding figure is 1,215 rooms. At the end of 1978, however, additional 1,868 rooms in Dubai and 750 rooms in Sharjah are due for completion. The present plans show that in the following two years, some 1,025 rooms would be added in Dubai and 1,660 rooms in Sharjah. The situation is not much different in Abu Dhabi.

10.21 A few major cases of industrial and infra-structural programmes in Abu Dhabi and Dubai alone illustrate an extremely high level of activity in the non-housing construction sector.

10.22 For computations of demand for building materials the following modifications for improvement, have been taken into account:

- a) use of sulphur blocks as a substitute for concrete blocks;
- b) brick-cavity walls as a substitute for concrete blocks;
- c) application of load-bearing brickwork concept to reduce concrete columns and beams;
- d) provision of surfaces without plaster;
- e) use of gypsum blocks and panels for interior walls;
- f) hollow structural clay blocks for prefabrication of components.

10.23 The demand for cement is estimated at 1.5 million tons per annum, of which 1 million tons for building purposes and 0.5 million tons for civil engineering works. These figures are lower than imports in 1976 (around 2.0 million tons). With a national production in 1978 of 1.5 million tons, increasing to over 2.0 million tons in 1980, the future import would be negligible. The suggested changes and development will result in a decrease of the demand for cement and thus in a potential for exports from the existing capacities. After the domestic market is well served, a more diversified production would be advisable, which might include white cement, low temperature cement and oil well cement.

10.24 The annual consumption of sand and gravel is estimated as follows:

	<u>Sand</u> <u>(Million tons)</u>	<u>Gravel</u>
For buildings	1.2	1.5
For civil engineering works	0.5	2.0
TOTAL	<u>1.7</u>	<u>3.5</u>

10.25 Figures for the civil engineering works, do not cover use of local sand and gravel. When sulphur resistant cement will be more widely used, there should be no reason for importing aggregates.

10.26 The national stone quarrying industry is under promising development and would easily meet the requirements of the market. Large quantities of the material in various sizes are being exported.

10.27 The present consumption of cement blocks is around 50 million blocks a year. A major part of the production is obtained from highly automated plants. The consumption will decrease to 20 million blocks a year or less, as bricks, sulphur and gypsum blocks take their part of the market. This will drive the smaller labour-intensive plants out of the market.

10.28 The consumption and production of prefabricated concrete components is estimated to be around 250,000 m³. The demand will stabilise around the above figure in favour of production of specialised and mechanised plants making components for open prefabrication system.

10.29 The imports of gypsum were of the order of 10,000 tons in 1976. The 1978 demand is estimated at 70,000 tons, of which 60,000 tons would be for production of cement. Since the domestic production is only 10,000 tons, 60,000 tons would be imported. By 1980, the demand for gypsum would expand to 150,000 tons, of which 100,000 tons would be for cement production and 50,000 tons for blocks, panels and plastering.

10.30 The estimated consumption of lime in 1978 is 55,000 tons, of which 25,000 tons is for buildings and 30,000 tons for sand lime bricks. When properties of lime mortar will be better acknowledged, the demand will increase for plastering and bricklaying. By 1980, the consumption will go upto 200,000 tons. A new plant at Al Ain would give around 35,000 tons. Additional modern plants making high quality lime will be needed.

10.31 The consumption of sand lime bricks in 1978 is estimated at 8 million bricks. The installed capacity is of the order of 40 million bricks. After 1980, a market for another—or two—combined plant, making both sand lime bricks and cellular concrete blocks, will develop.

10.32 The imports of tiles in 1976 were around 50,000 tons. The demand in the near future for tiles is expected to stabilise around the present figure.

10.33 Sanitary ware consisting, as an average, of a set of a bath, a wash-basin and a W.C. is expected to have a market of around 40,000 sets a year, corresponding to 8,000 tons of sanitary ware.

10.34 Based on the import statistics, demand for window glass in 1976 should be around 8,000 tons. According to the building activity, and applying the norms of consumption, the demand for building glass should in future be much higher depending on the degree of insulation provided. The consumption of glass wool is supposed to go up with increased use of cavity walls. A total annual consumption of building glass of between 12,000 and 40,000 tons a year is expected.

10.35 The use of sulphur and tiles is expected to be initiated in one or two years, using the sulphur waste from the oil industry. These could replace a large share of the concrete block and tiles market.

10.36 When a domestic steel production is initiated, reinforcement bars^{*/} will be one of the items being produced. The home market should easily be covered for the mild steel bars. The home market for reinforcement steel bars is expected to be around 100,000 tons per year.

10.37 The use of steel profiles for building purposes is not accepted in the Emirate of Abu Dhabi and, presumably, also in other Emirates because of the risk of corrosion. However, its interior use should be accepted, as air conditioning gives the necessary protection.

Present status of building materials

10.38 The following outline summarises the present position of the building materials industries:

- | | |
|-----------------|--|
| 1. Cement | Development steady and, in time, production in UAE to take over the whole domestic market. |
| 2. Sand, gravel | Abundant, but problems with salt and sulphur contents. |
| 3. Lime | National production developing steadily. |

^{*/} Present projects include production of bars based on imported materials.

- | | | |
|-----|--|---|
| 4. | Gypsum plaster, mortar, blocks panels | Scope for domestic production. A project proposed. |
| 5. | Sulphur blocks and tiles | Scope for domestic production. A project proposed. |
| 6. | Concrete blocks | High quality production at new automatic plants. Smaller plants likely to go out of market. |
| 7. | Sand lime bricks and light weight concrete blocks | Scope for domestic production. A project proposed. |
| 8. | Burned clay products | Scope for domestic production. Projects proposed. |
| 9. | Prefabricated panels and other components of reinforced concrete | Development is progressing rapidly. Use of the prestressed concrete technique suggested for pools and masts. |
| 10. | Steel reinforcement bars. | Domestic production taking over the market. |
| 11. | Aluminium | When the aluminium smelter at Jebel Ali starts to operate, a production of aluminium profiles is supposed to be taken up. |
| 12. | Woodware furniture | Domestic production on large scale not viable. |
| 13. | Water installations | Domestic production of pipes operating, production of fittings not considered viable. |
| 14. | Sewers, drainage pipes | Domestic production of pipes growing and covering the market. |
| 15. | Electric-ware | National production in general not viable. |
| 16. | Building glass | Domestic production possible. A project proposed. |

Criteria for project selection

10.39 For building materials, products preferred for manufacture or processing will be those with

- a) high specific weight,
- b) low cost to weight, and
- c) high wastage or rejection factor in shipping, such as for glass sheets.

10.40 Negatively, light products with small domestic market should receive low priority.

10.41 In exploring industrial opportunities for production of building materials, in addition to the basic conditions/constraints concerning capital, energy, water and manpower, the specific needs of UAE have to be reckoned with. These include increasing demand for better heat insulation, higher material and construction standards, longer life-time of buildings. In other words, the criteria should be reoriented towards building technology. This approach will take into account the impacts on demand by minimising over-dimensioning by the contractors of the structures resulting in better design, techniques and materials.

10.42 The industries which the UNIDO Survey Team 1975 considered of immediate relevance to UAE and for which studies were recommended include:

1. Brick manufacture, based on calcareous sands and low quality bricks from available, although inferior, clay;
2. Marble production located in or near the Masfout Range;
3. Sulphur cement production as a needed product in one or more of the cement factories;
4. High pressure cement blocks;
5. Builder's hardware;
6. Items of sanitary ware including fittings;
7. Paints and varnishes;
8. Galvanised iron sheets, pipes and wire;
9. Pipes from concrete;
10. One or two concrete mixing plants;
11. Asphalt batching plant for use in road constructions.

Recommended projects

10.43 On the basis of criteria for selection of projects, the following opportunities for manufactures appear to have a high degree of potential:

- a) gypsum plaster, mortar, blocks, panels;
- b) sulphur blocks and tiles;
- c) light weight concrete blocks;
- d) structural clay blocks; and
- e) window glass and glass wool.

Project for gypsum-based building materials

10.44 With gypsum deposits already being exploited (for Al Ain cement factory), other deposits found in Jebel Ali area, and a new mineral

survey going on, production of gypsum building materials shows promise. Leaving aside gypsum mortar for plastering, which is being produced, blocks, wall panels and tiles for ceilings are considered for production.

10.45 Blocks have an interlocking system, are hollow and are produced in three main sizes. Weight of each block ranges between 10 and 20 kg. Wall panels are made with hollow, vertical, cylindric cores, to reduce weight. They come in a standard size (10 cm x 50 cm x 250 cm) and in auxiliary sizes. They fit into each other by a tongue-and-groove system. Tiles are made principally in two sizes. They are made in relief of different patterns.

10.46 Blocks used for interior, even for the load-bearing walls, have a big, potential market. Competitive materials are concrete blocks, in-situ concrete, and eventually sulphur and light weight concrete blocks. Due to the smooth, white surface of the blocks it is expected that the market would be big enough to justify an economically sound size of production.

10.47 Wall panels aid in speedy erection and thereby in reduction of manpower components in construction. Tiles used for decorative ceilings have a limited market. Competitive materials are plastic tiles and gypsum plaster. When produced as artificial marble, these tiles may be used also on walls, which increases sales possibilities. The potential market is large. A survey to assess the precise size and characteristics of the market is needed.

10.48 In principle, there is no critical (minimum) size for production of gypsum building materials. It may be advisable to start with a rather low production of 20,000 tons/year. Gypsum, sand and water being the main raw materials, the project would have good prospects. This, however, would depend on the progress in finding new deposits of gypsum.

10.49 The production process is simple. Gypsum, mixed with additives to regulate the setting time and water, is poured into moulds with very smooth surfaces (polished steel, for example). The gypsum sets rapidly (in a few minutes' time), moulds are opened, the product released and transported for storage.

10.50 The number of workers required is only 10 per shift, of whom 2 will be skilled and 2 unskilled. Two technical supervisors would also be required to supervise the operations.

10.51 The capital cost of a gypsum building materials plant is estimated at Dh 2.20 million, of which the cost of plant and machinery would be Dh 1.00 million.

10.52 The annual cost of production is estimated as follows:

	<u>Dh</u>
Raw materials	1,000,000
Water, power and fuel	292,000
Manpower	500,000
Overhead	548,000
Capital charges	660,000
	<hr/>
	3,000,000
	<hr/>

10.53 The cost per 20-kg block would be higher than the price of concrete block. However, the blocks have an outstanding finish, making plastering unnecessary.

Project for sulphur blocks and tiles

10.54 The United Nations mission on housing in UAE has taken up a study on the use of sulphur as a building material. This study considers the production of sulphur blocks for use in one storey constructions and floor tiles. The study has proven that the process has inviting industrial and commercial prospects. The proposed plant will use waste from gas and local sand as raw materials.

10.55 Several products are possible, besides blocks and paving tiles. The blocks are made hollow with smooth sides, and are precision-made to be laid without mortar. The strength of the material is that of ordinary concrete. Tiles may be designed for an interlocking system.

10.56 Due to the high weight and low price, the products are not expected to be exported. The domestic market will have to be shared with concrete blocks and tiles. The market demand for blocks and tiles is estimated at 1.5 million m³ for blocks and 1 million m² for tiles (for outdoor pavement).

10.57 A reasonable, initial plant capacity, which may be considered, would be around 20,000 tons of blocks and tiles per year.

10.58 The plant should be located in close proximity to the stocks of sulphur waste and the market. The process involves: melting of sulphur (melting point between 114°C and 119°C), mixing sulphur (30-35%) with sand (70-65%), pouring the mix in a mould, opening the mould and greasing and assembling the mould.

10.59 Besides the management and commercial personnel, the manpower requirements are 10 technical personnel and 33 workers, of whom 26 will be unskilled.

10.60 The capital cost will be Dh 4.00 million of which plant and machinery will cost Dh 1.27 million and auxiliaries Dh 1.70 million.

10.61 The cost components are estimated as follows:

	<u>Dh</u>
Raw materials	1,000,000
Power and fuel (LPG)	200,000
Manpower	1,200,000
Overhead	1,400,000
Capital charges	1,200,000
	<u>5,000,000</u>

10.62 The power load required is minimal, 50 kW, with total energy requirement established at 100,000 kWh annually.

10.63 From the point of using waste material and sand, this project is ideal. It would be welcome to the construction industry since the sulphur blocks save manpower, avoid plastering and are easy to lay. The product economises on maintenance costs. The comparative cost advantage over concrete blocks would be as follows:

	<u>Sulphur Dh</u>	<u>Concrete Dh</u>
Blocks	50	26
Mortar	0	7
Labour for blocklaying	7	15
Plastering	0	22
Mortar for plastering	0	16
Painting	<u>0</u>	<u>20</u>
	<u>57</u>	<u>106</u>

10.64 This means that the sulphur block, when introduced should compete well with the concrete block. It would have the further advantage of the dry technique. In considering, however, the relative economies of the project, it should be emphasized that no commercial experience is yet available on use of the material and in-depth studies should precede launching of the project.

Project for light weight concrete blocks

10.65 As a useful side-product of sand lime bricks production, a type of light weight concrete, known as cellular concrete (trade names SIPOREX and YTONG are best known) is of interest because of its properties. A part of the machinery deployed to make sand lime bricks may be applied for making 'autoclaved gas concrete'.

10.66 Cellular concrete is manufactured in blocks. The density is between 300 and 700 kg/m³. It is a good heat insulating material with a reasonable strength. Permitted building height for cellular concrete load-bearing walls is usually four storeys. The relation between density and compressive strength is linear. The 400 kg/m³ material has a strength of 65 kg/m³. With natural (normal) moisture content of 8-15 per cent, the strength is around 70 per cent of the oven-dry cube-strength.

10.67 In some Northern European countries, the share of cellular concrete in the market of masonry products is around 10 per cent. In Southern Europe, the use is rather negligible. Owing to the heat insulation properties, the demand may be around 150,000 m² or 30,000 m³.

10.68 Since the project is conceived as an additional activity for sand lime brick plants, a capacity as low as 30,000 m³ per year would be economic.

10.69 For manufacture of light weight concrete, the light weight aggregate concrete (LECA) process is chosen, in which aluminium reacts with alkali. To increase strength and reduce shrinkage, curing is done in an autoclave under 10 atm (the same autoclave as used for sand lime bricks).

10.70 Among the raw materials required, lime is either burnt quicklime or cement. Quality must be uniform. The amount required is 18 to 25 per cent

of total weight. Burnt lime should contain minimum 70 per cent CaO, and maximum 5 per cent MgO, and no under- or over-burnt particles. Silica may be of quartz sand or fly ash, metallurgical slag, oil shale residue and other materials containing active silica. The quantity required is 70 to 80 per cent of weight. Aluminium is supplied (by specialised companies) in the form of fine, greased powder, with a minimum of 98 per cent Al, and with a specific surface of minimum 5,000 cm²/g (2%). Additives in small quantities are used to regulate speed of setting, to wet cement and aluminium, to stabilise gas cells. All raw materials (except additives) are available or would be available in UAE.

10.71 The additional manpower requirements would be small, 18 to 20. These would include 3 technical personnel, 2 skilled, 2 semi-skilled and 10 unskilled workers.

10.72 The capital outlay is estimated at Dh 3,500,000; of which Dh 2,100,000 for plant and machinery (autoclaves, forms cutters, mixers) and Dh 580,000 for auxiliaries and utilities.

10.73 The cost of production is estimated at Dh 200 per ton, or Dh 133 per m³, or 40 fils per block of 20 kg. The annual costs for full capacity production of 30,000 m³ or 20,000 tons/year is estimated as follows:

	<u>Dh</u>
Raw materials	1,000,000
Power, fuel and water	30,000
Manpower	850,000
Overhead	1,070,000
Capital charges	<u>1,050,000</u>
	4,000,000

10.74 As price for imported product (for example, SIPOREX) is around Dh 200 per m³, the estimated cost of Dh per ton appears promising.

Project for structural clay blocks

10.75 As the manufacture of burnt clay materials is unknown in UAE, the production of structural clay blocks has outstanding possibilities. The raw materials exist in sufficient quantities. Therefore, the feasibility of a plant with a modest capacity has been examined.

10.76 Burnt clay building materials cover a wide range of products, of different shapes, sizes and colours, for example, roofing, floor and wall tiles, glazed or unglazed, facing bricks, wall and floor hollow blocks, sun-screen hollow blocks, sanitary ware, refractory ware, sewerage and drainage pipes and other specialities. Many of these products will, in time, be fabricated in UAE. In the present profile, only one type is dealt with, the floor block.

10.77 The potential market is for roof and floor construction, representing more than 500,000 m² year. The product is easily handled and applied and it may eventually take over a substantial part of the market. Export would only be feasible to nearby countries, reached by road transport.

10.78 A tunnel kiln with dryers and with a capacity of 5 million blocks a year, meant to cover 500,000 m², would be economic.

10.79 Shale is excavated, trucked to plant, prepared by grinding and after adding water, extruded in heavy machinery, cut into blocks, dried and fired at a temperature around 100°C. This process is now traditional, and all know-how related to it is available.

10.80 Different deposits of shale will have to be examined in regard to the magnitude and quality. It would be advisable to send to different firms in countries, with available facilities, shale samples for testing and analysis. The manpower requirements will be: management 4, technical personnel 10, skilled workers 6, unskilled workers 12.

10.81 The capital cost of the plant is estimated at Dh 4.00 million of which machinery and equipment may cost Dh 2.00 million and auxiliaries and utilities Dh 0.50 million.

10.82 The production cost is estimated at approximately Dh 1.25 per block. The annual cost for production of 5 million blocks is estimated as follows:

	<u>Dh</u>
Raw materials	240,000
Water	10,000
Power and fuel	950,000
Manpower	2,000,000
Overhead	2,000,000
Capital charges	1,200,000
	<u>6,400,000</u>

10.83 The power requirements will be 150 hp. The oil consumption will be 400 local/kg clay.

10.84 If floors were made of solid concrete, the concrete consumption for 50,000 m² 15-cm thick flooring would be 70,000 m³. With hollow clay block, the consumption of concrete is reduced to 17,500 m³, resulting in a saving in cement of about 17,000 tons. There are also savings in labour, water consumption and foundations costs. The clay blocks are cheaper and more effective than the concrete blocks used for a similar purpose.

Project for window glass and glass wool

10.85 The demand for window glass is evaluated at 8,000 to 30,000 tons per year. There would be additional demand for glass wool. With glass wool production, the import of rockwool would decline since these two types of mineral wool are interchangeable in use. However, the demand is expected to increase, due to the trend towards better heat insulation (2 layers of glass). There are also some export possibilities.

10.86 The consumption of window glass (plain sheet glass) in selected countries is as follows:

	<u>Production</u> (Thousand tons)	<u>Consumption</u> (Thousand tons)	<u>Per capita consumption</u> (kg)
Denmark	24	30	6.0
France	216	189	3.7
W. Germany	370	358	5.3
Italy	562	539	9.9
Japan	145	783	7.6
Sweden	52	83	10.0
Turkey	63	64	1.8

10.87 When the building activity in UAE has reached a more normal level, the consumption might be expected to be close to 10 kg per capita, or about 10,000 tons/year in 1980 rising to 20,000 tons/year later. A glass factory of reasonable economic viability should have a capacity of 20,000 tons/year. The absolute minimum—one furnace, two machines—is 10,000 tons. This implies that a plant in UAE, to be viable in 1980, should have a product-mix which includes glass bottles. Despite the competition from plastics and cans, the growth rate for containers is higher than that for flat glass.

10.88 In Saudi Arabia, there is a plant making sheet glass. There is another in Kuwait. The total imports, via Dubai, in 1976 of sheet glass were 5,447 tons valued at Dh 7.95 million, giving an average price of around Dh 15/kg.

10.89 Window glass is normally manufactured in thicknesses between 2 and 5 mm. Specialities are reinforced glass, coloured glass, heat absorbing and special texture glass. These would continue to be imported for quite sometime.

10.90 In principle, the raw materials are melted at a high temperature (around 1,600°C) and, by a floating process, evenly distributed as a thin layer which continuously moves out to be cut into sheets as cooling down takes place.

10.91 A number of raw materials are used in glass manufacture: glass sand, soda ash (anhydrous sodium carbonate), limestone (pure calcium carbonate), magnesite (pure magnesium carbonate), dolomite (calcium carbonate with 20% of MgO), feldspar (potassium, sodium or calcium), fluorspar, gypsum (hydrate), borax (anhydrous), barium carbonate (anhydrous), arsenious oxide, cullet-glass reject, charcoal.

10.92 Glass sand constitutes about 70 per cent of the total amount of raw materials by weight. In 1960, a UNIDO expert on a mission reported that no good glass sand was found in UAE. However, a geological evaluation is now in progress. Indications are promising, specially from Sharjah.

10.93 No final justification on the industrial utilisation of sand for sheet glass manufacturing in UAE can be expressed before laboratory tests are carried out on sand with a high silicum content and a low iron content (less than 0.025% Fe_2O_3). The grain composition is regulated by "scalping" (sieving) the sand if the grains are greater than 0.6 mm in diameter, or too small (0.1 mm). By washing the sand, the tailings, the finest grains, are washed away. Thus, the grain composition may be regulated, but the high contents of silicum is a must.

10.94 Soda ash is the second largest component, the more expensive. This raw material is specially prepared for the glass industry in the form of free flowing

granules of high purity and will have to be imported. Limestone and gypsum are locally available. Other components are rather low, both by weight and value, and there should be no problem in importing these.

Policies and institutional organisation

10.95 The building material industries are now being scattered among a relatively large number of small, labour-intensive industries. In pursuance of the basic industrial strategy, this practice should be discouraged and large, labour saving automated plants producing high quality products should be encouraged.

10.96 The Federal Ministry of Public Works and Housing is attempting to co-ordinate the building activity. The Ministry has yet to develop the functions of long range planning and of promoting and regulating, by standardisation, the building materials industries. These functions are being performed, in some measure, by several Ministries and other organisations in their respective areas. These include Ministries of Petroleum and Mineral Resources, Economy and Commerce, Finance and Industry, Municipalities of the Emirates. In view of the fundamental problems of construction industry and the importance of the sector in the national economy, better co-ordination and planning are imperative.

10.97 Two institutions should be established: (a) the Building Research Institute, and (b) the League of Building Professions, of which, in the initial period, the Building Research Institute may act as the Secretariat. The functions of the Building Research Institute should be as follows:

- a) to serve as the national clearing-house for technical assistance provided by international agencies;
- b) to assist in surveys of natural resources, particularly by carrying out sample analyses;
- c) to assist government agencies in preparing plans for the development of the building materials industry by carrying out surveys and studies on the use of materials;
- d) to provide technical advice to industrial enterprises on producing materials and to users on the selection and performance of materials;
- e) to adopt standards for use under local conditions;
- f) to assist in the development of proposals for dimensional co-ordination.

10.98 For consultancy services, the preference should be for one long term consultancy organisation. Appropriate institutions should be provided for middle level technicians/engineers. In due course, a Polytechnic should be created at the University at Al Ain.

10.99 Special national building norms and standards should be developed to conform to local climatic conditions and materials.

CHAPTER 11

FOOD INDUSTRY

Rationale of domestic industry

11.01 The food industry plays a small part in the country's economy. The more significant development has been in wheat and flour production and processing of carbonated beverages and potable mineral water industries.

11.02 In view of the small domestic production of agricultural, livestock, fisheries and other edible materials, the country is heavily dependent on imported products for both consumption and processing.

11.03 At current prices, imports increased more than seven-fold in the decade between 1968 and 1977. In 1976, the value and consumption of imports* and exports were as follows:

	<u>Imports</u> (Million Dh)	<u>Exports & Re-exports</u> (Million Dh)	<u>Net Imports</u> (Million Dh)
Food and live animals	1,054.6	246.8	807.8
Beverages & tobacco	156.8	43.2	113.6
Meat & vegetables	22.8	1.7	21.1
Total	<u>1,234.2</u>	<u>291.7</u>	<u>842.5</u>

11.04 Apart from food industries surveyed earlier, there are plans to increase output of food products including animal feed. These are actuated by the objective to reduce the country's dependence on imported food products processed and packed, and to utilise domestic raw materials. While there is potential for development of industries which can be based on locally available materials, for the most part, raw materials that are suitable for use in food industries will have to be imported.

11.05 Because of domestic production of certain raw or semi-processed materials, there is a need to reduce imports of some food products, such as wheat flour, wheat bran, bread, fancy breads, cakes, pastry,

* / Products imported in 1976 through the ports of Abu Dhabi and Dubai are itemized in annex 15.

pasteurised milk, yogurt, soft cheese, ice-cream, maize grist-based flips, carbonated beverages, potable mineral water and frozen, salted, and dried fish. How this can be accomplished is a matter of policy.

11.06 The domestic market is in many cases too small for economic production. By employing a policy of co-ordination among all Emirates, this problem can be minimised.

11.07 In agriculture, where productivity has increased five-fold or more in the last ten years, prospects are promising. According to the planned programmes, there would be self-sufficiency in parts of agricultural and marine products, which will enable the country to process local materials and, hopefully, to export surpluses.

11.08 Available local raw materials that can be utilised, in the near future, for development of food industries will include:

- a) agro-based materials, e.g. dates, mango, tomatoes, potato, eggplant and pepper, wheat flour, wheat bran;
- b) livestock-based materials, e.g. buffalo meat, poultry, sheep, lamb, milk and eggs;
- c) marine products, e.g. different types of fish and seafood;
- d) natural products, e.g. potable water.

11.09 The available quantity of wheat flour and wheat bran is sufficient to establish industries such as bakery products, biscuit and wafers, cakes and pastries, ice-cream specialities, pasta products (spaghetti, macaroni), ice-cream wafer cones, animal and poultry feed.

11.10 Industries which may be developed on the basis of imported raw materials include coffee (roasting and grinding), vegetable oils and fats, snack foods, chocolate and chocolate preparations, sugar and oriental confectionery, fresh and dried active baking-yeast, sugar cubes, special cakes and ice-creams, pudding jelly, baking powder, whipped cream powder, non-alcoholic beer and infant foods.

11.11 The first concrete step toward promotion of industries in this area would be to conduct detailed market surveys, which will need to be followed by comprehensive techno-economic feasibility studies or, in some cases, prefeasibility studies.

Investment opportunities

11.12 Based on apparent consumption and likely trends, an attempt was made to estimate the demand for preserved, processed and manufactured food products in UAE up to 1990. The projected demands are analysed and presented in Table 11.01.

11.13 The projected norms of consumption take into account the current consumption levels and the variations expected in the light of changing income levels and food-habits. Adequate provision has been made, where necessary for imports, since domestic production cannot have 100 per cent penetration in the open market conditions of UAE. An appraisal has been made of the export potential in selective cases. The total apparent demand thus takes care of imports, re-exports, export potential, besides norms of per capita domestic consumption.

11.14 Following the location-oriented approach adopted in identifying the opportunities in food industries sector, the projects are divided into six groups:

- A. Industries located in raw material producing areas;
- B. Industries located in consumption centres;
- C. Industries located at port towns;
- D. Industries located close to super market and hyper market complexes;
- E. Industries which may be located in one of the Gulf countries;
- F. Joint-projects with developed or industrialised countries;

11.15 Tables 11.02 to 11.04, give an enumeration of the new industrial projects considered for in-depth studies. The tables incorporate basic characteristics of the identified opportunities: the products, recommended capacities, suggested locations (in most cases with alternatives), estimated investment outlays and manpower requirements .

TABLE 11.01

DEMAND PROJECTIONS FOR SELECTED FOOD PRODUCTS

1990

Industries by Product	Ratio, Domestic Production to Imports	Production (Tons)	Total Demand (Tons)
A. <u>Industries located in raw material producing areas</u>			
Canned seafood	80:20	5,600	7,000
Frozen seafood	100:00	3,200	3,200
Dates	100:00	24,000	24,000
Tomato puree	20:80	2,200	11,200
Jam, marmalade	50:50	1,600	3,200
Fruit and vegetable juices	10:90	4,800	48,100
Poultry	100:00	32,000	32,000
Prepared meat	20:80	1,600	8,000
Eggs	100:00	16,000	16,000
Honey	100:00	1,600	1,600
Beverages	90:10	130,000	144,000
B. <u>Industries located in consumption centres</u>			
Milk powder*	60:40	6,700	11,200
Ice-cream	100:00	4,800	4,800
Wheat flour**	100:00	123,000	123,000
Biscuits	80:20	5,100	6,400
Pasta products	80:20	5,100	6,400
Chocolate and chocolate preparations	60:40	1,900	3,200
Sugar confectionary	70:30	3,900	5,600
Ice-cream wafer cones	100:00	150	150
Cereal snacks	80:20	2,600	3,200
C. <u>Industries located at port towns</u>			
Sugar refined (packing)	100:00	40,000	40,000
Sugar cube	100:00	1,600	1,600
Rice	100:00	80,000	80,000
Dry beans, chick peas	100:00	8,000	8,000
Tea	50:50	5,600	11,200
Roasted coffee	80:20	3,900	4,800
Animal feed	100:00	116,000	116,000
Spices, (mostly pepper)	70:30	2,300	3,200
Roasted & salted mts	80:20	2,600	3,200

* Ratio, milk powder to fresh milk = 1:10

** Ratio, wheat flour to bread = 1:1.35

continued

Table 11.01 continued

Industries by Product	Ratio, Domestic Production to Imports	Production (Tons)	Total Demand (Tons)
D. <u>Industries located close to super-market and hyper-market complexes</u>			
Fresh vegetables	20:80*	19,000	96,000
Fresh fruit	20:80*	19,000	96,000
Fresh meat	20:80*	2,600	13,000
E. <u>Industries which may be located in one of the Gulf countries</u>			
Vegetable oils and fats	100:00	16,000	16,000
Chewing gum	70:30	1,800	2,400
Baking powder, pudding, etc.	70:30	2,300	3,200
F. <u>Joint-projects with developing or industrialised countries</u>			
Baby foods	70:30	1,200	1,600
Frozen vegetables	80:20	5,200	6,400
Pickles (vegetables)	80:20	1,300	1,600
Canned vegetables	80:20	10,200	13,000
Canned fruits	80:20	5,000	6,400
Fruit juices	100:00	48,000	48,000
Cheese and curd	70:30	4,800	6,400
Brewery (non-alcoholic beer)	50:50	2,400	4,800
Fresh meat	100:00	13,000	13,000
Sugar refined (mill)	100:00	42,000	42,000
Yeast (active, fresh and dried)	100:00	3,200	3,200
Vinegar	100:00	1,600	1,600

* Ratio, packed to bulk = 20:80

TABLE 11.02
POTENTIAL INDUSTRIAL OPPORTUNITIES IN FOOD INDUSTRIES
TO BE LOCATED IN THE UNITED ARAB EMIRATES
 1978-1990

Industrial Opportunities by Products	Recommended Capacity (tons/year)	Suggested Location	Estimated Investment (million Dh)	Estimated Manpower *	Priority**
<u>A. Industries located in raw material producing areas</u>					
Canned ready-made seafood products	10,000	Ajman, Fujeirah, Sharjah and Umm al Quwain	20.00	50	HP
Frozen ready-made seafood products	10,000	Ajman, Fujeirah, Sharjah and Umm al Quwain	30.00	50	HP
Ice plants and cold storages close to each seafood and marketing unit	10,000	Various sites	12.00	12	HP
Date and date confectionery	5,000	Abu Dhabi, Fujeirah, Ras al Khaimah and Sharjah	8.00	20	HP

* Based on single shift (throughout the table).

** HP = High priority; MP = Medium priority; LP = Low priority.

continued

Table 11.02 continued

Industrial Opportunities by Products	Recommended Capacity (tons/year)	Suggested Location	Estimated Investment (million Dh)	Estimated Manpower	Priority
Tomato puree, pickled vegetables and mango confiture	Tomato Paste: 1,000 Mango: 500 Other: 500	Abu Dhabi, Fujeirah, Ras al Khaimah and Sharjah	20.00	15	MP
Tomato, citrus and mango juices	4,000	Abu Dhabi, Fujeirah, Ras al Khaimah and Sharjah	30.00	20	HP
Potato ready-made products	2,000	Abu Dhabi, Fujeirah, Ras al Khaimah and Sharjah	30.00	20	MP
Chicken and other meats ready-made products	1,500	Available sites close to poultry farms	16.00	18	HP
Egg processing	500	Close to chicken farms	12.00	10	HP
Mineral water***	18,000	Abu Dhabi, Fujeirah and Ras al Khaimah	22.00	20	HP

*** Additional plant

continued

Table 11.02 continued

Industrial Opportunities by Products	Recommended Capacity (tons/year)	Suggested Location	Estimated Investment (million Dh)	Estimated Manpower	Priority
Carbonated mineral water (with curative properties)	18,000	Ras al Khaimah	24.00	20	MP
Bee-keeping and honey packing	200	Abu Dhabi, Fujeirah, Ras al Khaimah, Sharjah	1.00	16	HP
B. Industries located in consumption centres					
Dairy farm	4,000	Abu Dhabi- Al Ain highway	22.00	2	HP
New dairy	3,000-4,000	Abu Dhabi- Al Ain highway	18.00	15	HP
Small-scale bakeries	600	Various sites	3.60	14	HP
New bakery close to flour mills	3,000	Abu Dhabi and Dubai	15.00	20	MP
Cakes and pastry	2,000	Ajman and Umm al Quwain	10.00	18	LP
Frozen ready-made pastry	2,000	Abu Dhabi and Dubai	14.00	18	MP
Pasta products	3,000	Abu Dhabi	16.00	15	HP

continued

Table 11.02 continued

Industrial Opportunities by Products	Recommended Capacity (tons/year)	Suggested Location	Estimated Investment (million Dh)	Estimated Manpower	Priority
Biscuit and wafers	2,500	Abu Dhabi and Dubai or Sharjah	22.00	20	HP
Ice-cream wafer cones	150	Ajman and Umm al Quwain	1.50	2	MP
Chocolate, chocolate preparations and sugar confectionery	5,000	Abu Dhabi	40.00	40	HP
Oriental confectionery	1,500	Ajman and Umm al Quwain	15.00	25	MP
Hazelnut-chocolate cream and bars	1,500	Sharjah	15.00	15	MP
Typical municipal slaughter- house and cold storage	Should be determined	Various sites	2.50	5	HP
<u>C. Industries located at port towns</u>					
Sugar and cube sugar. (packing)	12,000	Abu Dhabi	6.00	10	HP
Rice, dry beans and chick peas	30,000	Dubai or Sharjah	7.00	10	HP
Tea (cutting and packing)	2,500	Abu Dhabi, Ajman and Ras al Khaimah	15.00	15	MP
Spice (grinding and packing)	1,500	Ajman and Umm al Quwain	3.50	8	MP

continued

Table 11.02 continued

Industrial Opportunities by Products	Recommended Capacity (tons/year)	Suggested Location	Estimated Investment (million Dh)	Estimated Manpower	Priority
Coffee (roasting, grinding and packing)	1,000	Abu Dhabi, Dubai and Sharjah	7.00	10	MP
Animal feed	25,000	Abu Dhabi, Ajman, Dubai and Ras al Khaimah	40.00	12	HP
Nuts (roasted and packed)	1,500	Ajman, Fujeirah, Ras al Khaimah and Umm al Quwain	8.00	10	HP
D. <u>Industries located close to super market and hyper market complexes</u>					
Fresh meat (cutting, weighing, labelling and packing)	3,000		0.80	6	HP
Fresh fruits and vegetables (sorting, weighing, labelling and packing)	6,000		0.80	6	HP
Miscellaneous foodstuffs (private label packing)	12,000		3.00	12	MP

TABLE 11.03
POTENTIAL INDUSTRIAL OPPORTUNITIES
FOR EXPANSION OF EXISTING UNITS

1978

Industrial Opportunity by Products	Recommended Capacity *	Estimated Investment (million Dh)	Estimated Manpower *	Priority **
Abu Dhabi Refreshments Co., Abu Dhabi	15,000 t/yr	20.00	25	HP
Gulfa Potable Mineral Water Co., Ajman	10,000 t/yr	10.00	10	HP
Potable Mineral Water Co., Musafi	10,000 t/yr	10.00	10	HP
Dubai Dairy Farm, Dubai	2,000 t/yr	4.00	2	HP
Digdaga Dairy Farm, Digdaga	4,000 t/yr	8.00	2	HP
National Food Co., Milco, Abu Dhabi	7,000 litres of milk/hour 2,000 litres of ice-cream hour	10.00	15	HP
Gulf and Safa Dairies Co., Dubai	7,000 litres milk/hour	7.00	8	HP
Galdahari Ice-cream Co., Dubai	1,200 t/yr			
Golden Bakery Co., Abu Dhabi	1,500 t/yr	7.50	12	HP

* Based on single shift

** HP = High priority

TABLE 11.04
POTENTIAL INDUSTRIAL OPPORTUNITIES IN FOOD INDUSTRIES
FOR JOINT-VENTURES IN GULF COUNTRIES
 1978-1990

Industrial Opportunity	Recommended Capacity (tons/year*)	Estimated Investment (million Dh)	Estimated Manpower*	Priority**
Processed soyabean and products	100,000	260.00	25	HP
Chewing gum	4,000	22.00	24	MP
Baking powder, pudding powder, Jelly powder, whipped cream powder	2,500	6.50	20	MP
Petroprotein	300,000	1,000.00	130	HP

* Based on single shift.

** HP = High priority; MP = Medium priority.

TABLE 11.05
 POTENTIAL INDUSTRIAL OPPORTUNITIES IN FOOD INDUSTRIES
 FOR JOINT VENTURES IN OTHER COUNTRIES

1978-1990

Industrial Opportunity	Recommended Capacity (tons/year*)	Estimated Investment (million Dh)	Estimated Manpower**	Priority**
Frozen vegetables	15,000	50.00	30	HP
Pickled vegetables	4,000	10.00	40	MP
Canned vegetables	20,000	50.00	40	HP
Canned fruits	10,000	35.00	40	MP
Fruit and vegetable juices	25,000	50.00	40	HP
Refined sugar	200,000	250.00	50	MP
Baking yeast (fresh and dried)	4,000	28.00	20	MP
Vinegar	2,000	12.00	20	LP
Cheese and curd	5,000	20.00	20	HP
Baby foods	4,000	25.00	20	HP
Brewery (non-alcoholic beer)	200,000	60.00	30	MP
Large-scale meat-farm and slaughter-house	20,000	50.00	50	HP

* Based on single shift.

** HP = High priority; MP = Medium priority; LP = Low priority.

11.16 In the course of this exercise, an attempt was made to identify a few illustrative cases of existing units, which call for redesigning, rehabilitation or modernisation of plant and equipment and which are particularly amenable to expansion. This does not imply that other plants do not have the potential for expansion of their capacities or for diversification of their products. The plants which have been chosen for redesigning and modernisation are enumerated in Chapter 4 and those for expansion are listed in Table 11.03.

A. Industries located in raw material producing areas

Seafood products

11.17 Although UAE exports seafood, it imported in 1976, via the ports of Abu Dhabi and Dubai,

- salted and smoked fish	17 tons
- frozen seafoods	540 tons
- canned seafoods	6,735 tons

11.18 The imports can be reduced or replaced by domestic manufactured items. High quality seafood in attractive packaging would also improve exports. The known resources, the local demand and export potential warrant the identified projects. The product-mix should include frozen seafood, canned seafood, salted fish, smoked fish, pickled seafood and fishmeal.

11.19 There are some 5 or 6 small seafood manufacturing units operating in UAE. A private sector fishmeal plant, set up in Ras Al Khaimah under the management of a Norwegian firm, closed down at the end of 1977. The plant needs to be redesigned to be a viable unit.

11.20 Available seafood potential, accessible to the UAE, has been estimated by several experts and consultants. The individual estimates vary. UNIDO Team, which carried out an industrial survey in 1975, also made an estimate of seafood potentials accessible to the UAE. A thorough survey and investigation is in progress.

Fruits and vegetable processing

11.21 While UAE is both a producer and exporter of dates, it imports dates. Its aggregate imports, via ports of Abu Dhabi and Dubai, of dates and date confectionery amounted to 2,549 tons (Dh 4.80 million) in 1975. Modern manufacturing methods and higher quality would lower the imports.

High quality dates and date confectionery in attractive packaging would improve export of these items.

11.22 UAE has substantial imports of jam, marmalade and confiture. As the surplus of mango is expected to occur soon, the addition of another production line to the proposed tomato puree manufacturing, seems to be a viable proposition.

11.23 There are no aggregate figures available for imports of tomato puree, ketchup and related products. Dubai imported about 670 tons of these products valued at Dh 14.59 million. Tomato and mango-based products can be seasonally adjusted to enable better capacity utilisation of equipment. Imports of fruit and vegetable juices, tomato, mango and citrus juices or nectars, can be economically substituted by establishing processing facilities in the raw material producing areas using advanced processing and packaging techniques and equipment.

11.24 Since surplus of potato production is expected, the establishment of a potato ready-made products manufacturing plant seems to be feasible. Dry potato snack products could be produced by using imported dry potato flour.

11.25 The expected product-mix will thus consist of (a) fresh fruits and vegetables, (b) weighed, labelled and packed fresh fruits and vegetables in small units, (c) dates and date confectionery, (d) canned tomato puree and ketchup, (e) pickled tomatoes and vegetables, (f) bottled and packed mango and/or citrus confiture, (g) bottled and canned fruit and vegetable juices or nectars of mango, citrus fruits, tomato, and (h) potato ready-made products.

11.26 There are no manufacturing units for the products identified for production. Although a considerable variety of crops are grown in agricultural areas, the quantities are generally not sufficient at present for establishing any manufacturing plant on an industrial scale. When, as programmed, larger outputs are available, giving surplus over consumption of fresh products, appropriate manufacturing facilities may be established.

Poultry and eggs

11.27 The aggregate imports of poultry in 1976 were of the order of 22,000 tons valued at Dh 105 million. There are more poultry farms planned, besides a new one in Falaj Al-Mulla now in operation. These will have a production of up to 15 million fowls. There are further possibilities for expansion of 10 million fowls. This would lead to surpluses suitable for manufacturing chicken-based prepared products. One or two units may be established. The location should be close to or in the vicinity of existing or planned poultry farms.

11.28 Demand for chickens and other meat products will increase with the population. Assuming that 20 per cent of the total production will be used for manufacturing of the prepared foods, and assuming that ready-made chicken-based products including sausages can compete on price and quality with imported items, there is a scope for major expansion of poultry production and processing of available surplus.

11.29 The demand for egg-products will increase as a result of increase in population and development of egg-products consuming units (producing pasta, biscuits, wafers, ice-cream). There is a scope for major expansion of eggs production balanced by processing of estimated 20 per cent of the surplus. In both cases, chicken-based prepared foods and egg-based products, an export potential is not ruled out.

11.30 The product-mix may take the following pattern:

Poultry: smoked and canned sausages, ready-made items,
frozen items;

Other meats: smoked and canned sausages, ready-made items,
frozen items;

Eggs: dried, frozen, mayonaise, salad dressings.

11.31 The two projects recommended are:

- a) a prepared chicken and other meats manufacturing plant with a capacity of 1,500 tons a year; and
- b) an eggs processing plant with a capacity of 500 tons a year.

Non-alcoholic beverages

11.32 The aggregates import of non-alcoholic beverages in 1976 were of the order of 12,900 tons. After providing for re-exports, the average per capita consumption in UAE for years 1975 and 1976 may be put at about 70 kg. Further consumption of non-alcoholic beverages will increase with the expansion of population. On the basis of a per capita consumption of 90 kg, the total demand for non-alcoholic beverages in 1990 would be of the order of 130,000 tons. At least seven to eight large-scale non-alcoholic beverage bottling plants are already operating. Although some of these plants have programmed to expand their output, there is further potential for an increase in capacity. The product-mix should include: bottled and canned carbonated beverages, soft fruit drinks, potable mineral water and carbonated potable mineral water.

Bee-keeping and honey packing

11.33 The imports of honey, via ports of Abu Dhabi, in 1976, were of the order of 210 tons valued at approximately one million dirhams. It is proposed that the development of bee-keeping and honey packing establishments be considered, each with a capacity initially of about 50 tons per year.

11.34 It is expected that four bee-keeping units could be started at Al Ain, Al Dhaid, Fujairah and Ras al Khaimah, the capacity of which may increase gradually corresponding to the size of market demand. These areas grow citrus fruits and alfalfa. The later crop will need to be increased in order to cope with the expansion of small scale animal breeding farms. Moreover, the best and most expensive kinds of honey in the world markets are the citrus and alfalfa honey. The presence of colonies of bees assist in polination of flowers of valuable crops, including fruits and vegetables, thus helping in increasing their yield. Special bee-parcels from well-known species of bees that give good quality honey and high yields will have to be imported for the project. Few standard hives could be purchased from England, among others, and the rest could be manufactured locally.

Honey could be packed, with or without wax (the latter requires centrifugal machines), into glass jars or PVC containers.

Edible salt

11.35 Technical and economic investigations have indicated a large potential for the manufacturing of edible salt (NaCl) and other salts based on the effluent discharges of desalination plants.

11.36 The production of edible salt by evaporation of effluents of the desalination plants is planned by ADNOC. This project is in the construction stage and will probably start operation in 1979. A further edible salt manufacturing plant is, therefore, excluded from further consideration in the present context.

B. Industries located in consumption centres

Dairies

11.37 The import of milk powder, mostly used for manufacture of reconstituted pasteurized milk, laban, ayran and other products, through the ports of Abu Dhabi and Dubai, aggregated to 6,600 tons valued at Dh 38.59 million. There are two producers of fresh milk, the Dubai and Digdaga dairy farms. In the coming years, the number of milk cows will be increased to 1,500, producing some 5 to 6 million litres of fresh milk annually. The Abu Dhabi Emirate plans to establish along Abu Dhabi-Al Ain highway a milk farm with 1,000 milk cows, producing 3-4 million litres of fresh milk yearly.

11.38 There are several private and government-owned dairy units and ice-cream plants operating in UAE. Their product-mix is somewhat limited.

11.39 The following projects are recommended:

- | | |
|------------------------------------|--|
| a) Expansion of Dubai Dairy Farm | 1.5 to 2 million litres of pasteurized milk/year |
| b) Expansion of Digdaga Dairy Farm | 3 to 4 million litres of pasteurized milk/year |
| c) New Dairy Farm | 3 to 4 million litres of pasteurized milk/year |

- | | |
|---|--|
| d) expansion of National Food Products Co. | 7,000 litres of pasteurized milk and 2000 litres of ice-cream per hour |
| e) expansion of Gulf and Safa Dairies | 7,000 litres of pasteurized milk per hour |
| f) new dairy | 3,000 to 4,000 tons of cheese, curd and butter per year |
| g) expansion of Snotex Ice-cream and Cake Co. | 2 tons of ice-cream and cakes per shift |
| h) expansion of Galdahari Ice-cream Co. | 4 tons of ice-cream |

Flour mills

11.40 There are two flour mills now in operation. Both have an aggregate annual capacity of about 100,000 tons of wheat flour and about 10,000 tons of wheat bran. Future demand of flour will increase corresponding to the expansion in population. At present, the per capita consumption is about 70 kg per year. In 1990, therefore, the total demand for wheat flour-based food products would be approximately 122,000 tons. Increase in flour mill capacity may, therefore, be excluded from further consideration in the present context.

Bakeries

11.41 Bread is varied in its final form. In UAE, more traditional recipes have been maintained with the bulk of production in the form of Arab bread with a shelf life of a day only. The short shelf life necessitates the bakery to be located closer to the consumption centre. Annual per capita consumption of bread, in 1975 and 1976, is estimated at about 54.6 kg or a little over 1 kg per week. The wheat flour used for other purposes such as cakes or biscuits is only marginal.

11.42 Future consumption of bread will increase with the size of the population. At present, it seems best to assume that per capita consumption will remain at about 70 kg per year. In 1990, therefore, total demand for bread will be some 165,000 tons (1 kg of wheat flour corresponds to 1.35 kg of bread).

11.43 The product-mix will include all types of breads, Arab, Iranian, Pakistani and European fancy breads as well as cakes, pastry and frozen pastry.

Pasta products

11.44 Pasta products are eaten in most countries including UAE. These products compete with rice, potato and bread. The finished product can take many forms and sizes for use in soups, meat dishes and other food preparations. Pasta products are relatively cheap. The per capita consumption depends more on eating habits, with price elasticity being low. Gross imports of pasta were 1,442 tons in 1975 and 4,440 tons in 1976. After providing for re-exports, the average consumption per capita in UAE may be put at about 2.8 kg annually.

11.45 Demand for pasta products will increase with the population. The projected demand would be a little over 6,400 tons in 1990. This size of the market would be enough to support a local production unit. There is scope to replace imports by domestic production to the extent of 80 per cent. The example of some neighbouring countries would suggest potential for exports. There is no existing unit.

11.46 A new plant with an annual capacity of 3,000 tons is proposed. The product-mix should include spaghetti, macaroni, bologna, lasagna, and canelloni.

11.47 The raw material, wheat flour (special type of wheat is needed) can be supplied by the new flour mills in Abu Dhabi and Dubai. Eggs and edible salt could also be supplied domestically.

Biscuits and wafers

11.48 Biscuits and wafers are a non-essential foodstuff. Per capita consumption, therefore, has positive correlation with income levels. Gross imports of biscuits and wafers were of the order of 3,200 tons in 1975 and 4,200 tons in 1976. Providing for re-exports, average consumption per capita (for years 1975 and 1976) is estimated at about 3.5 kg annually.

11.49 Based on the population, per capita consumption and re-export pattern, the total apparent demand would be in the neighbourhood of

6,500 tons in 1990. Even after providing for imports and possible exports to neighbouring countries, the demand may exceed 5,000 tons.

11.50 The product-mix may include plain and chocolate coated biscuits and wafers. There is, at present, no manufacturing unit. A plant with a capacity of 2,500 tons/year may be established.

11.51 The raw material, wheat flour, can be supplied by the new flour mills. Eggs, fat and edible salt may also be domestically supplied. Other ingredients such as baking powder, sugar, milk powder, chocolate, have to be imported.

Ice-cream wafer cones

11.52 The ice-cream wafer cones consumption will increase almost correspondingly with ice-cream consumption. Let alone the demand of other neighbouring countries, the future demand in UAE alone would be enough to support a small-scale production unit. A plant with a capacity of 500 kg of both sweet and non-sweet wafer cones per shift may be established. The raw material supply position is the same as for the preceding item.

Maize grist and dry potato-based snack products

11.53 There is a private plant in Abu Dhabi producing cereal-based snack products. Although the imports are substantial, there is a fair scope for the expansion of the capacity of the present plant. The size of expansion can be determined by a market survey. The product-mix for the expansion will cover maize grist-based flips and chiplettes, dry potato-based snacks, pop corn and potato chips. Almost all ingredients, low fat content maize grist, dry potato flour, cheese powder, have to be imported. Edible salt and vegetable fat may be domestically supplied.

Chocolate, chocolate preparations and sugar confectionery

11.54 Imports in 1976 of chocolate and chocolate preparations via ports of Abu Dhabi and Dubai, aggregated to 1,177 tons valued at about Dh 8 million. The import of sugar confectionery was of the order of 4,400 tons valued at over Dh 14 million.

11.55 There is a potential for establishing a chocolate, chocolate preparations and sugar confectionery plant in one of the countries of the region. All forms of confectionery melt in hot climate, but this is a problem common to most food products. The subject products are non-essential foodstuffs. Per capita consumption, therefore, grows with income levels. The range of chocolate, chocolate preparations and sugar confectionery is very wide and, competition is fierce. As a result, aggressive marketing and promotion are an imperative. Moreover, packaging and design are a most significant element.

11.56 The major raw materials needed for chocolate and chocolate preparations are cocoa liquor, cocoa butter, cocoa powder, vegetable fat, sugar, milk powder, soya lecithin, roasted nuts, dried fruits. The major raw materials needed for sugar confectionery manufacturing are sugar, sugar syrup, edible acid, milk powder, roasted nuts.

11.57 The following projects are recommended:

	<u>Annual capacity</u>
a) chocolate, chocolate preparations and sugar confectionery plant	5,000 tons
b) confectionery plant	1,500 tons
c) hazelnut-chocolate cream and bars manufacturing plant	1,500 tons

Municipal slaughterhouses

11.58 Some municipal-owned slaughterhouses are already operating. The domestic supply of cattle, lambs and other animals for slaughtering is negligible. Bulk imports of live animals would be expensive. This problem might be resolved in future with extensive animal breeding programmes in the country.

11.59 A typical municipal slaughterhouse and cold storage plant may be established with a capacity to be determined by a thorough market survey. The products will include slaughtered animals, sorted and cut meat and chilled and frozen meat.

C. Industries located at port towns

Refined and cube sugar

11.60 There is a scope to substitute packaged refined sugar imports by domestic packaged items. A unit with a capacity to process 12,000 tons/year on single shift basis may be established. The product-mix will include:

- refined sugar in 1,2 and 5 kg bags,
- cube sugar in 0.5 and 1 kg boxes, and
- powder sugar in 0.5 kg bags.

Rice, dry beans and chick peas

11.61 Presently, UAE imports its requirements of packaged or bulk rice and dry beans and chick peas. A packing plant with a capacity based on one shift of 30,000 tons per year to pack rice, dry beans and chick peas may be established. The products will be packed in 0.5, 1, 2 or 5 kg polythene bags or boxes.

Tea, coffee, spices and nuts

11.62 Since there is no tea bags or tea boxes packing plant in UAE, one could be established appropriate to the local demand. Some popular brands will be imported anyway since it is difficult to blend teas of all tastes. The recommended capacity, based on one shift, is 2,500 tons per year. The tea will be supplied in tea bags ready for instant use (20 in a box) and tea boxes of 50, 100 and 250 g and tea sacks of 1 and 5 kg.

11.63 There are a few privately-owned small units for roasting and grinding of coffee but the quality of their product is not acceptable. A modern large scale coffee roasting, grinding and packing unit with a capacity of 1,000 tons/year should be considered. It will be based on inputs of selected green coffee of high quality. The products will cover Turkish, espresso and filter "fresh coffee flavour" packings.

11.64 The capacity proposed for the grinding and packing unit for spices is 1,500 tons/year. The marketable packs would be small bags or glass jars. There is no domestic supply of spices and imports of spices will continue.

11.65 Based on the population and per capita consumption, the apparent demand for roasted nuts in 1990 in UAE is estimated at about 3,200 tons. A roasting and packing plant with a capacity of 1,500 tons of nuts per year is recommended after providing for continuing imports, on the one hand, and likely exports to neighbouring countries, on the other. The products may take many forms: roasted and salted peanuts, almonds, pistachio, sunflower seed, and assortments thereof.

11.66 There is no domestic supply of nuts. Imports, therefore, of raw peanuts, almonds, cashewnuts and others will have to continue.

Animal feed mill

11.67 An animal feed mill is recommended since the quantities of imports of chickens, eggs, milk, meat and animal feed are rising and the demand would rise further. There is a shortage of animal and chicken feed in the international market leading to opportunities for export. There are new poultry farms now in operation and other are under development

11.68 UAE has recently started two new flour mills in Abu Dhabi (output 200 tons/day) and Dubai (output 100 tons/day) which would provide about 10,000 tons/year of wheat bran suitable for use in animal feed.

11.69 Most of conventional proteins are produced in specific areas of the world, such as Peru for fishmeal and the USA for soyabean meal. Any restrictions in supply, such as total lack of fish experienced in Peru in 1972, causes large fluctuations in world prices for protein-rich commodities. The supply of protein within the country will avoid these problems.

11.70 It is understood that Kuwait is proposing to instal the first export-oriented plant in the Gulf area for the production of high protein yeast from crude-oil derivatives. This type of powdered yeast is readily acceptable for feeding chicken and farm animals. The powdered yeast could be a suitable raw material for the proposed animal feed mill in UAE.

11.71 The animal and chicken feed requirements in 1990, based on detailed computation of FCR (feed conversion ratio), will be as follows:

	<u>Tons</u>
For broilers	66,000
For eggs	46,000
For milk	4,000
Total	<u>116,000</u>

11.72 This does not take into account the feed required for meat cows, lambs and other animals. However, the total requirements estimated would be reduced if other feed components are mixed by the farms.

11.73 The recommended capacity of the animal feed plant is 25,000 tons/year. The plant's output can be increased as needed, since the capacity would be based on single shift. The product-mix should include, as indicated, feed for broilers, layers, milk cows and others.

11.74 The following inputs for the recommended project can be produced locally: fishmeal, wheat bran, oil-cake (groundnuts and others) and lucerne grass (alfalfa, dried, whole or powdered). Apart from the other ingredients, the sources of which were indicated, a further item will be corn. Imports of corn, minerals, vitamins and part of alfalfa requirements, would have to be effected.

11.75 The feasibility of a project for petro-protein with a capacity of 300,000 tons per year may also be considered. Since Kuwait is going ahead with the project, it would be advisable either to collaborate with Kuwait or to wait until the plant has established its commercial credentials.

D. Industries located close to super-market and hyper-market complexes

11.76 The food industries units which should be situated close to super markets and hyper-markets are those which supply the consumer with fresh food products, such as packaged fresh meat and meat preparations, fruits and vegetables. Two units are proposed:

- a) a fresh meat cutting, weighing, labelling and packing unit with a capacity of 10,000 units per shift;
- b) a fruit and vegetables sorting, weighing, labelling and packing unit with a capacity of 20,000 units per shift.

E. Industries which may be located in one of the Gulf countries

Edible oils and fats

11.77 Large imports of edible oils and fats are being made by UAE and other countries in the region. There is one privately-owned edible oil and fat plant in operation at Dubai with a capacity of 30 tons/day and using groundnut as a raw material. Vegetable oils and fats can be manufactured from various raw materials: soyabeans, coconuts, cottonseed, groundnut. No domestic supply of raw materials exists in UAE. The raw materials, primarily soyabeans, are readily available on world markets.

11.78 The feasibility of a soyabean oil processing plant with a capacity of 100,000 tons/year may be examined. This should take into account the programmes in the pipeline in the neighbouring countries. The product-mix should include edible oils in bottles, edible vegetable fat and soft and low-calorie margarine. The by-products will be soyameal, soya lecithin and similar items. Protein is a by-product of soyabean processing. Oil cake as a protein rich by-product could be used as an ingredient for the proposed animal feed plant.

Miscellaneous food products

11.79 Considering the large imports of chewing gum, a non-essential item, and the low quality of local production, there is commercial potential of a plant with a suggested capacity of 4,000 tons per year on single shift basis. The products will include: stick chewing gum, bazooka type bubble gum, soft'n bubble gum, fruit filled chewing gum and chewing gum specialities.

11.80 Presently, UAE and the countries in the region, import their requirements of baking powder, pudding powder, jelly powder, whipped cream powder and ice-cream powder. The range of items is very wide and brand competition is intense. As a result, aggressive marketing and promotion are common. A project with a capacity based on single shift of 2,500 tons per year is recommended for consideration. This will produce all the enumerated items.

F. Joint-projects with developing or industrialised countries

11.81 Actuated by the considerations: (a) that all countries desire to have a direct or indirect control over Food supplies; (b) that UAE has constraints on supplies of raw materials and manpower and has limited

demand not adequate for production on a viable basis; and (c) that UAE should make foreign investments in direct production facilities; it is recommended that some industries, particularly in the food sector, may be selected for investments abroad in collaboration with developing or industrialised countries on a bilateral basis. This approach has the potential for application in other selected commodities.

11.82 The possibilities, among others, are:

- a) Sugar mill and refinery with a capacity of 200,000 tons/year;
- b) Frozen vegetables plant with a capacity of 16,000 tons/year;
- c) Pickled vegetables plant with a capacity of 4,000 tons/year;
- d) Canned vegetables plant with a capacity of 20,000 tons/year;
- e) Canned fruits plant unit with a capacity of 10,000 tons/year;
- f) Fruit and vegetable juices plant with a capacity of 25,000 tons/year;
- g) Baking yeast (fresh and dried) manufacturing plant with a capacity of 4,000 tons/year;
- h) Vinegar manufacturing plant with a capacity of 12,000 tons/year;
- i) Brewery (non-alcoholic) producing beer with a capacity of 200,000 hl per year;
- j) Large scale meat-farm and slaughterhouse with a capacity of 20,000 tons/year;
- k) Cheese and curd manufacturing plant with a capacity of 5,000 tons/year;
- l) Infant foods manufacturing plant with a capacity of 4,000 tons/year.

11.83 The capacities recommended are all on single shift basis except for the sugar mill and baking yeast plant.

Marketing

11.84 All products of domestic food industries are distributed, in most cases, in the Emirate of location, but for some products, such as ice-cream,

carbonated beverages, potable mineral water, a pattern of marketing throughout the UAE is emerging.

11.85 The markets of the Emirates need to take steps which will enlarge the scope and range of distribution and marketing of both domestic and imported food products.

11.86 There are in shops and super markets, substantial quantities of imported food products, the date of use of which has expired. A permanent control system should be established and food products which do not conform to quality and health specifications should be destroyed.

11.87 When some of the industries identified for export markets have been established, it would be necessary to introduce certain export promotion measures, and if necessary, an export promotion organisation. However, as indicated earlier, export promotion is not a preferred objective for products which are basically, not only directly, water-consuming.

Policy measures:

11.88 A thorough micro-level study of food industries and related activities should be undertaken to determine imperfections in design, quality control and working conditions of the establishments.

11.89 To develop the food industries on sound basis, it would be advisable to establish institutions to cover the following functions:

- a) development and co-ordination of food industries
- b) quality control and inspection
- c) hygiene, health control and inspection
- d) codes, norms and standards.

11.90 As a new unconventional dimension, for agro-based industries and specially food industries, a reference was made to a nuclear oriented agro-industrial complex with a long term perspective in view. The possibilities in this regard should be explored with technical assistance obtained from an international organisation like UNIDO. The first step will be a pre-feasibility study.

CHAPTER 12

BASIC METALS AND METAL WORKING INDUSTRIES

Material resources

12.01 For developing metal working, engineering and electrical industries no basic resource, except source of energy is available. There are some indications of iron ore existence in Fujaira area on the east coast (the Oman range of mountain) but no specific data are available regarding proven deposits, which must undergo detailed geological investigations.

12.02 Some industries which are under construction or in various stages of planning, will in due course provide the initial resources for the development of metal working industries, including engineering, electrical goods, and possibly, electronics industries.

12.03 As pointed out in Chapter 2, an aluminium smelter of 130,000 tons/year capacity is in advance stage of construction in Dubai Emirate. A major part (80%) of the metal to be produced in this plant is meant for export, leaving only about 25,000 tons for rolling and fabrication. This resource is recommended to be utilised to develop industries like aluminium fabrications, ACSR conductors, aluminium cables and anodised aluminium products.

12.04 Two sponge iron projects are under consideration, one at Dubai and the other at Abu Dhabi, each with a capacity of 400,000 tons/year. On realisation of these, products will be available for development of steel and steel-based industries in UAE.

12.05 Energy is, of course, an important input of basic metals industries such as aluminium, sponge iron, steel (based on electric arc furnace). In fact, it is cheap energy source which has actuated the above mentioned projects.

Conditions and criteria for identification

12.06 As a first approach to the identification of industrial opportunities, the above-mentioned factor endowments were examined in the context of general and specific constraints on potential industries in the sub-sector. Apart from the shortages of material resources, manpower, skills and technological base, it was noted that the size of the domestic market is also much too

small for industries in the candidate area. Exports, on the other hand, involve high transportation costs undermining drastically the competitive strength of the national industries. Some of the potential industries which could be sustained by the developing domestic market are labour-intensive and had to be discarded at the present stage of development. The geographical conditions with high salinity in the atmosphere and rather severe climatic features tend to reduce further the list of potential viable industrial ventures. Some of the industries which were eliminated include:

- Distribution transformers
- Metal-clad switchgears
- Electric motors
- Miniature lamps
- Hand tools like spanners and screw drivers
- Electrical domestic appliances
- Assembly of television sets, radios, tape recorders and calculators.

12.07 Apart from the resources, the criteria taken into account for identification of industrial opportunities are: (a) capital intensity, (b) low labour content, (c) freight cost factor, (d) skill requirements, (e) economics of size, (f) availability of basic semi-manufactured inputs, (g) inter-industry linkage within UAE and with countries in the region, Arab countries, and other developing countries offering materials, manpower, technology or markets.

12.08 There are not many metal working industrial units operating in UAE. Most of them are small and manufacture very simple products, such as small water tanks, aluminium doors and window frames or, are repairs and maintenance workshops. An assembly for air conditioners was set up. In Dubai a barrels plant was inaugurated only recently. A rolling mill has been established by the Emirate of Abu Dhabi and another is under construction in Dubai.

12.09 In conformity with the appraisal of factor conditions and criteria, two groups of industries have been identified: first group, covering industries for which detailed feasibility studies should be taken up soon to determine the techno-economic viability; and the second group, covering industries for which more detailed investigations are considered essential before commissioning detailed feasibility studies.

Fabrication of GI water-tanks for domestic use

Spark plugs for automobiles

Electric bulbs and fluorescent tubes

12.12 A factor of basic importance in launching new industrial ventures in the subject sub-sector is that the project must ensure high quality of products conforming to internationally acceptable standards.

Project for aluminium smelting

12.13 Aluminium is a versatile substitute in electrical industry, structural application, building and furniture trade. Its competitive price and its characteristics of resistance to corrosion in humid and saline atmosphere has given this metal an edge over others. Its demand has been continuously rising and has special significance to the climatic conditions in UAE.

12.14 Raw materials required for the manufacture of aluminium are alumina and electrical energy. About 18,000 kW of electrical energy are required to produce one ton of aluminium metal. The economics of aluminium production, therefore, depend largely on the availability of cheap electrical power. The production is also highly capital intensive. Because of these considerations, there is a strong justification for establishing large aluminium smelting capacities along with extrusion and fabrication facilities. There should not be much difficulty in importing alumina from other countries by concluding a long term arrangement. The requirements will be about 400,000 tons annually for a project with a capacity of 200,000 tons of metal. Aluminium produced in the proposed plant will be mostly exported, with some quantity used for domestic consumption.

12.15 One aluminium smelter of 130,000 tons/year capacity is already under construction near Jebel Ali. A power house, having an installed capacity of 472 MW, is also being erected as a facility for the plant. Maximum demand of this smelter is expected to be about 380 MW. The higher power capacity was planned to supply also a water desalination plant. This unit is expected to be ready for trial runs towards the end of 1978 and is scheduled to go into full production before the end of 1979.

12.16 In addition to the Dubai plant, there is scope for another smelter in Abu Dhabi. As a major part of the finished products from

this smelter would be exported to different countries, the cost of production is a decisive factor. Accordingly, a larger smelter capacity of 200,000 tons per annum is suggested.

12.17 A detailed feasibility study of this highly capital intensive project must include international demand forecast and analysis and recommended product-mix of the fabrication and extrusion sections.

12.18 On the basis of present cost estimates, an aluminium smelter of 200,000 tons annual capacity would cost about Dh 3,200 million. It has been assumed that the power required for the proposed smelter would be made available from the Emirate supply or the national grid if and when one is created as recommended in the present study.

Project for structural metal products

12.19 Aluminium doors, windows and other structural items in the construction of homes, offices and industrial buildings are required in large quantities. The demand, at present, is being met by imports. In addition, there is also a fairly large requirement in the super structures of modern fleet of tankers in view of the dry docks complexes and the shipping traffic in Abu Dhabi and Dubai.

12.20 Since the basic raw material, aluminium, would be available from the aluminium smelter, a unit for aluminium extrusion is recommended with a capacity of 30,000 tons/year to be expanded later in stages. It would, in fact, be preferable if a large capacity can be established which will make the facility economically attractive.

Project for aluminium anodising

12.21 The use of dyed anodised aluminium is becoming increasingly popular. The dyed aluminium is as fast to weathering as plain anodised and sealed aluminium. It is because of these properties that aluminium is now widely used in the construction and fabrication of articles in daily use, such as jewellery, toys, reflectors, doors and windows, furniture, building sections, architectural metal work.

12.22 The capital cost of a plant with anodizing capacity of 24,000 m² per year is estimated at Dh 1.24 million.

Project for manufacture of ACSR conductors

12.23 The use of steel cored aluminium conductors in place of hard drawn copper conductors, particularly in transmission system of energy, has become very common. This is due to economy involved and easy availability of aluminium. In view of the extensive programme of power development and industrialisation, the demand for conductors (ACSR) will be on the increase.

12.24 The plant now being proposed might have an initial capacity of 200 metric tons of ACSR per month.

12.25 The fixed capital cost of the project would be approximately Dh 25.00 million with a manpower requirement of 25.

Project for graphite electrodes

12.26 The graphite electrodes are one of the down-stream products of petroleum industry. There will be fairly good demand for the product in UAE and in the Gulf region. It is a project of high priority. A plant with an annual capacity of 25,000 to 40,000 graphite electrodes may be considered, the precise figure to be determined by a feasibility study. The plant cost of a project with a capacity approximately to the higher level of the range suggested would exceed Dh 300 million.

Project for industrial fasteners

12.27 At present, the requirements for industrial fasteners are met by imports. The requirements will considerably increase in the years to come when the ambitious industrial development programmes recommended in the present report are implemented. It is in this context of future demand in UAE and the region, that a unit to manufacture industrial fasteners is recommended.

12.28 The proposed plant shall manufacture bolts, nuts, rivets, screws and pins, of various sizes. The initial capacity may be of the order of 1,600 tons/year, which will need an investment of about Dh 2.00 million.

Project for sponge iron complex and rolling mill

12.29 The level of imports of structural re-inforcement bars in the last few years had been about 50,000 tons per year. Although, requirements of steel bars for building construction work in UAE is not going to be as high in the years to come, but the requirements of steel, as a whole,

would grow with industrial development. This would justify a sponge iron complex with a captive rolling mill for production of necessary sections and bars.

12.30 The Abu Dhabi Emirate is in an advantageous position to undertake this project in view of the abundant availability of natural gas which can be used as the reducing agent in the process of sponge iron manufacture. Power required for the furnace for refining the sponge iron and for operation of the rolling mill should not pose any problem.

12.31 Presently, Abu Dhabi is considering a sponge iron project having a capacity of 400,000 tons/year with an investment of Dh 1,000 million. However, in view of the industrial development plans and the economics of production, this capacity of 400,000 tons/year is considered to be low. It is, therefore, proposed that a sponge iron complex having an initial capacity of one million tons per annum with a provision for expansion at a later date, be considered with facilities for continuous casting. The investment involved for this project is estimated at around Dh 1,800 million. At a later date, additional facilities for a furnace to feed a small merchant mill, capable of rolling light sections from ingot/billets, may be installed.

12.32 The supply of two important factors, raw material and water, should be given a serious thought before launching the project. In-depth investigations are necessary in selecting the basic raw material, iron ore or pelletized ore. It may however, be mentioned that pelletized iron ore plant based on imported iron ore having a capacity of about 5-6 million tons per year of pelletizing, would be of advantage not only to UAE but also to the Gulf region as a whole as there is no such plant in this area. Such a plant, however, requires very heavy infra-structure by way of port facilities, transportation requirements and handling arrangements, and one must consider if it could be economical to plan such a heavy 'weight-losing' industry in UAE.

Project for automobile batteries

12.33 No data regarding demand of batteries for automobiles are readily available. The consumption of automobile batteries in UAE during 1974 is reported to have been 800 tons when the number of vehicles was 80,000. The number of vehicles is on the increase. It has exceeded 130,000 in 1978 and would be at least 250,000 by 1985.

Prospective projects

12.10 In the first group, the following projects are recommended for consideration:

	<u>Initial Annual Capacity</u>
Aluminium smelter in Abu Dhabi Emirate	200,000 tons
Aluminium fabrication and extrusion, sheets, sections pipes and others	30,000 tons
Structural metal products (e.g., aluminium doors and window and facade parts)*	3,000 tons
Anodised aluminium products	25,000 m ²
ACSR conductors and all aluminium conductors	4,000-5,000 tons
PVC insulated wires and cables	2,000 tons
Graphite electrodes **	25000-40000 tons
Industrial fasteners	1,600 tons
Centralised maintenance workshop for repair and serving of electrical and mechanical appliances, such as air conditioners, refrigerators, cooking ovens.	
Sponge iron complex and rolling mill (with a possible iron ore pelletizing facility)	1,000,000 tons
Wire and wire products, (e.g., barbed wire, nails, screws and bolts)	
Fabricated metal products	
Metal furniture and fixtures.	

12.11 The industrial opportunities identified for the second group, that is, those which need pre-feasibility investigations, are the following:

Automobile batteries of international standards
(capacity: 140,000 units/year)

Dry batteries

Distribution transformers and LT switchgear

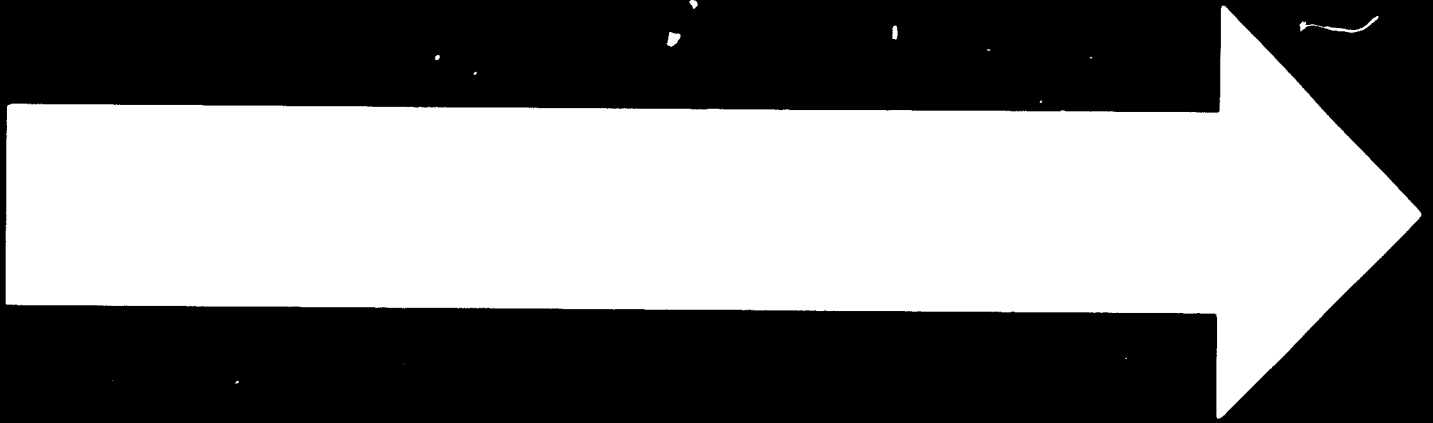
Assembly of air conditioners refrigerators, and watercoolers
(capacity: 50,000 units/year)

Building hardwares, (e.g., outdoor closers, handles, hinges and locks)

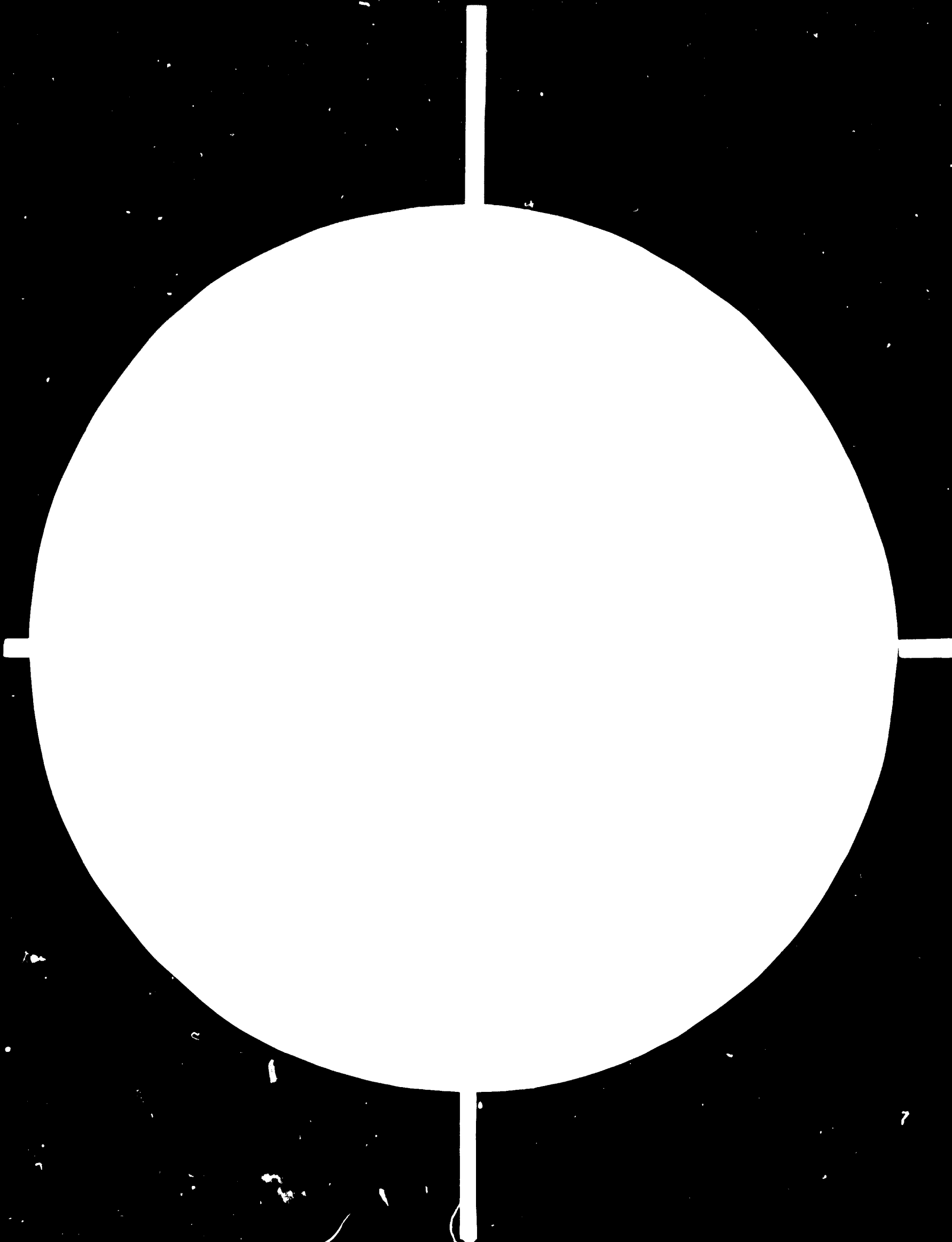
* It is noted that some units already exist. The products, however, are generally, of sub-standard quality and the costs are relatively high. The need for a detailed market survey is indicated.

** See chapter 9.

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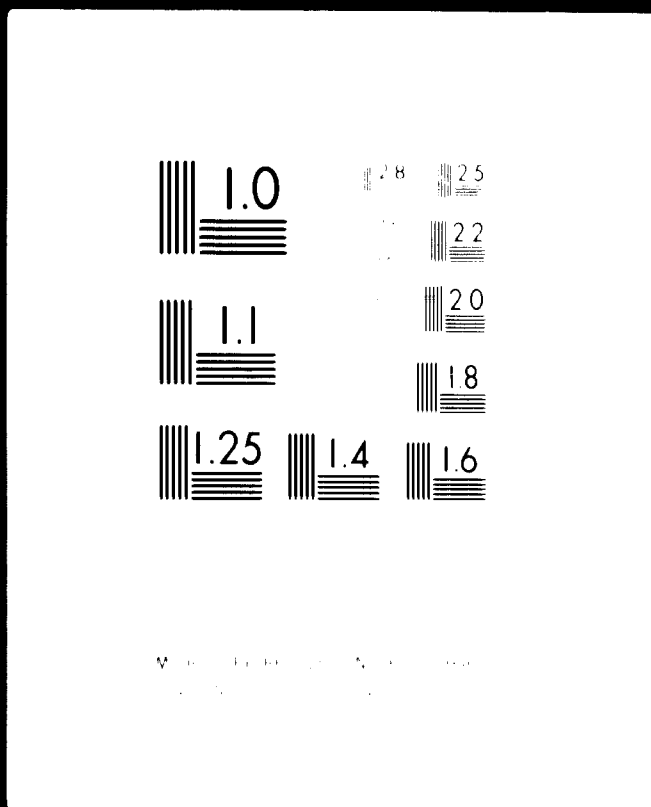


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12.34 The demand of 2,500 tons (140,000) of batteries per year should be able to sustain a viable manufacturing unit in UAE. However, a detailed study to determine the techno-economic viability of this project is recommended.

Project for assembly of air conditioners, refrigerators and water coolers

12.35 The climate of UAE necessitates the use of air conditioners, refrigerators, water coolers and related items. There is an assembly unit. The annual requirements of these items both on replacement account and new provisions is estimated to be around 50,000 units. These requirements would further increase because of the industrial development and newly emerging administrative and commercial complexes.

12.36 It is, therefore, recommended that a unit to assemble air conditioners, refrigerators, water coolers and related items be established. Initially, the requirements of sealed units and related electrical controls would be imported. An arrangement with some of the world's well-known manufacturer would be essential. The total manpower requirements would be 50 and the fixed capital involved is estimated at Dh 2.50 million.

Project for spark plugs for automobiles

12.37 No statistical data are available regarding import of spark plugs in UAE. However, on the basis of number of vehicles and applying standard norms of consumption in the light of local conditions, the demand for spark plugs is estimated between 1.5 and 2.0 million by the year 1985.

12.38 A plant having a production capacity of at least one million spark plugs per year is considered to be a viable one. Production technology and process know-how will have to be negotiated with some well known manufacturers. This is an item which can be promoted for exports, in particular, to the Gulf region. The number of vehicles in the region is expanding at a high rate and the product is a light and sophisticated item and one which requires specialised technology for manufacture.

Manpower development and training

12.39 In preparing programmes for the development of the subject sub-sector, the two imperatives are the adoption of automation to

economise on manpower and recruitment of trained and skilled manpower of high-level capability. The training programmes may be organised with the machinery and know-how suppliers. However, the restraining problem is the employment of unstable immigrant labour who could not be sent for training and development.

Testing laboratory

12.40 The need for establishing a central testing laboratory is indicated since most of the manufactured products would have to compete directly with imported high quality products. The testing facilities are also required to ensure high quality of raw materials and bought-out components. These would require rigid quality control at all stages of production, right from the intake of raw materials to despatch of the respective finished products. Later on, such an institution should liaise with similar institutions in the Gulf region to evolve progressively common standards for the region. This does not include industrial control and testing laboratories which would be necessary in some of the larger units in view of their special requirements of sophisticated testing equipment.

CHAPTER 13

POLICIES AND INSTITUTIONAL FRAMEWORK

Industrial law and regulation

13.01 There is no industrial law in UAE for the regulation of industrial development and operations. A draft was prepared some time ago and is now under active consideration of the Government. A perusal of the draft available has shown that a re-examination of some of the provisions will help in streamlining the administrative procedures and in strengthening the machinery needed for extending support to industrialisation in UAE.

13.02 The draft law is understood to cover industrial undertakings the fixed capital of which is not less than Dh 250,000 or the employment of which is not less than 10 workers. Any industrial establishment falling within the scope of the regulation will require an industrial licence before it is established.

13.03 Much bureaucratic time is wasted and projects are unduly delayed because of cumbersome licensing procedures. In some countries, the industrial licensing system has come under much attack and has had to be liberalised because the licensing emerged as a distinct bottleneck rather than as an aid to industrialisation. It should be realised that the basic objectives of a rational industrial licencing system include:

- a) channeling the industrialisation process into the right directions;
- b) allocation of scarce resources to most productive uses by assigning proper priorities;
- c) providing a direction to industrial investors with a view to limiting waste of resources.

13.04 One of the effective ways by which much of bureaucratic red-tape can be avoided is to provide a precise application form. The form should be so designed that it obviates the need for a project 'feasibility study'. Such studies usually do not follow any standard formats and coverage.

13.05 The proposed law envisages the establishment of an Industrial Register in which relevant data will be recorded for all the registered enterprises. The Register will cover the existing enterprises which will be enrolled within 3 months of the promulgation of the new law.

13.06 The law provides for the assistance incentives/concessions/exemptions which are conventionally provided by most of the developing countries. The following types of projects are proposed to be treated on preferential basis:

- a) providing commodities substituting imports and having export potential;
- b) using local raw materials;
- c) established in areas specially designated by the Government;
- e) project of special economic importance specially those receiving such evaluation by a development plan.

13.07 The first two conditions are too general and may cover all industrial projects. While the intention may be to extend the coverage to all viable projects, the use of the term preferential treatment does not justify this. A more basic criteria in addition to c) and d) should be value added. The value added should, for purposes of concessions/incentives, cover overall contribution to GDP and not merely added value by manufacture.

13.08 The preferential treatment to products of local industry for purposes of government purchases in terms of price may be subject to the following two conditions: (a) the price differential should be not more than 10 per cent, and (b) the production of the subject product did not commence more than 5 years before the date of submission of the tender. The condition (b) is envisaged to extend support to new, infant industries, which have an initial disadvantage.

13.09 The criteria proposed for the appraisal of the applications for concessions/exemption should be supported by the following:

- a) inter-linkage of existing industries/economic activities by backward or forward integration;
- b) self-reliance in selected areas;
- c) development of regional balance/and of selected industrially backward areas;
- d) promotion of international cooperation, bilaterally or multilaterally, as a result of a specific agreement or a general programme.

13.10 The proposed industrial law provides for collection of data by the Department of Industry and extends the facility to investors/industrial establishments to call for statistical data, results of studies, maps and other relevant information from the Department of Industry. It enjoins upon the Department to provide direction to new investors. In this regard three distinct actions may be programmed:

- a) preparation of a comprehensive Guide for Investors, which should be updated from time to time;
- b) publication of licences issued and progress made by industrial projects;
- c) publications of classified lists of
 - industries having prospects for developments
 - industries which require intensive studies for development
 - industries which are not recommended for development and for which, in a given period, no approval would be granted.

13.11 An industrial licensing system may become less productive unless there is a built-in mechanism in it for monitoring of progress, which has two facets:

- a) industrial growth,
- b) operational performance,

A licensing system is concerned primarily with phase a) and phase b) is covered under industrial statistics and has relevance to industrial licensing as a feed-back mechanism for future planning. A provision for semi-annual reporting by licensees should be made an integral part of the industrial licensing system, and a time limit should be prescribed so that if 'effective steps' are not taken by the promoters, the license should be cancelled after an appropriate appraisal.

Institutional framework for industrialisation

Ministry of Industry

13.12 With the acceptance of industrialisation as a major economic objective, it may be worthwhile to consider seriously the separation of the Ministries of Finance and Industry. The task of industrial development in all its facets, will require all-out, multi-dimensional and intensive efforts.

13.13 The Ministry of Industry should equip itself for the task of industrial development by creating the following organs charged with respective functions:

Centre for Industrial Studies and Development (CISD)
Division of Industrial Regulation and Direction (DIRD)
Federal Agency for Industrial Promotion and Assistance (FAIPA)
Project Assistance Task Force (PATF)
Federal Industrial Data Bank (FIDB)
Division of Standardisation and Technology

13.14 Each of the organs will require its own specialised staff. While the first four will be the integral part of the Ministry, the last should preferably be a separate autonomous unit. Registration of industrial enterprises, more of an administrative function, could be added to FIDB since it will have to secure the information inputs for its own system.

13.15 There is a division of standardisation and metrology in the existing framework, but this needs to be transformed into an active agency for acquisition, transfer and development of technological capability. This division will need to be supported by a well-equipped laboratory and workshop. It may organise a separate unit to assist the industrial promoters in locating the preferred technical know-how, equipment and consultancy services.

13.16 The principal functions of CISD will be to develop industrial plans and programmes to identify new industrial opportunities as a feeder activity to the Ministry of Planning and to propose priorities for licensing, promotion and assistance. It may undertake, commission, sponsor, support or assist pre-investment studies and investigate into industrial problems and their impacts on industrial and economic development.

13.17 The DIRD may be charged with the functions relating to the regulation of the industrial laws and to take necessary preventive and curative measures for their compliance.

13.18 The FAIPA should constitute the major promotional agency for industrial programmes and assistance, including technical assistance. It will, among other things, advise the Ministry on the promotional measures and incentives and their effectiveness, monitor the progress of industrial programmes,

guide and assist industrial promoters and organise technical, managerial and other operational assistance by establishing extension services.

13.19 The project assistance task force should organise advisory assistance on planning and implementation of projects. The PATF will act as a liaison between the developmental agencies like the Department of Industries in the Ministry of Finance and Industry and Development Banks, on the one hand, and promoters, projects and establishments, on the other. The PATF should consist of:

- a) a project planner;
- b) a project evaluator;
- c) a project management specialist;
- d) a market analyst;
- e) a cost analyst;
- f) engineers with specialisation in industrial, mechanical, civil, electrical, electronics and chemical engineering.

13.20 It is needless to say that some of the units of the Ministry should be branched-off to locations outside Abu Dhabi. The effective use of the service facilities and regulation requires that these should be available locally. Dubai, in particular, is a major commercial and potential industrial area and should receive necessary attention.

13.21 The scope of activities of FIDB should include the preparation of industrial indices and other industrial indicators in addition to the usual functions of a date bank.

Other institutions

13.22 Four other institutions which are considered vital in the field of industry and may be promoted, are:

Management Development Institute (MDI)

Stock Exchange (SE)

UAE Industrial Development Bank

UAE Foreign Investments Promotion and
Guarantee Corporation

Management development

13.23 A direct consequence of the large investment in the manufacturing sector and the limited size of the developing population, will call for the concentration of the national local force in supervisory and

higher level jobs. This tendency should be welcome inasmuch as this will tend to keep the income levels of the nationals relatively high. It is, therefore, necessary to concentrate on manpower development programmes on supervisory, technical and managerial levels.

13.24 In view of the brief industrial history and sophisticated and accelerated pace of industrialisation desired, it is necessary that management skills be developed at various levels. While it is true that UAE nationals have done well in trading activities, the industrial expertise and experience is yet to be developed. The major tasks to be accomplished by them would relate to managerial functions in all areas of industrial management, especially project planning and development, financial planning and control, market research, promotion and organisation, international marketing and management of research and development.

13.25 The skills are required at all levels: the top management, the middle management and lower operational levels.

13.26 The first UAE University has started functioning this year. Among the Faculties established, one is for Political Science and Administration. Business Management and Accounting is an independent Department under this faculty.

13.27 A proposal for separating the two functional areas by creating an additional Department is under active consideration. The University will be well-advised to concentrate on broader management functions in the first two years of study and to impart specialisation in the last two years. It is also advisable to transform the Accounting Department into a Financial Management Department. The present programme is to prepare students for a four-year bachelor's degree course in Business Management and Accounting.

13.28 The consensus at the University appears (a) to support the idea of a Management Development Institute, and (b) to create a separate autonomous institution independent of the University.

13.29 The autonomous institution could be sponsored by the Ministry of Planning or the Ministry of Finance and Industry. The Ministry of Planning should be preferred since it would be desirable to cover management of different sectors/functions:

- development management
- economic management
- resource management
- industrial and business management
- management of specialised functions
and institutions

13.30 Although sponsored by the Government, the Government, the industry (both in the public and private sectors) and the University should participate and cooperate in the work of the institution. The Chambers of Commerce can play an active role in the area of management development both inside and outside the proposed MDI.

13.31 The management institute should organise (a) long term (say, one year) courses, (b) medium term (say, one to six months) programmes, (c) short term seminars, workshops, lectures, (d) audio visual demonstrations, including screening of industrial films, and (e) management games.

13.32 The management institute should organise exchange of its faculty members with management personnel working in industry. The institute should also sponsor exchange programmes with other institutes and industry in countries outside the UAE, both developed and developing. The seminars and conventions organised for top and high-middle levels of management are of special significance in UAE.

Capital market

13.33 The establishment of properly organised and regulated stock exchanges would be advisable for UAE since private enterprise is considered a major instrument of industrialisation. A stock exchange encourages the mobilisation of private savings for commerce and industry. Consideration should be given to convert all public sector projects and industry into joint stock companies and to welcome private participation by means of shareholding. Similarly, the participation of the State in private or joint sector projects should primarily be in the form of shares or loans. No active capital market will be created unless information on share prices is freely available.

13.34 An efficiently operated stock exchange will be the forerunner of more responsible and effective industrial management since the management that is exposed to the public eye tends to become more efficient and

vigilant. Stock exchange operations should be designed to minimise speculation.

13.35 To start with, one stock exchange located either at Abu Dhabi or Dubai will meet the requirements. Additional exchanges or branches may be established later.

Tariff protection versus positive assistance

13.36 Until the individual Emirates follow independeny customs policies, tariff protection to industry cannot be considered effectively. Since inter-Emirate trade is free, imported goods at low or no customs levy may find sursresptitious way into the protected markets.

13.37 Tariff protection is a fair and legitimate tool for industrial promotion. Infant industries cannot stand on their own against fierce competition from international markets, specially from multi-nationals, unless their products are suitably protected. Indiscriminate or liberal protection policy can do harm to growth of efficient industry; but selective, restrained, conditional tariff protection is an effective and legitimate instrument of industrial policy in developing countries.

13.38 And yet, in the prevailing economic environment of UAE, it would be preferable that instead of a pbbkrcy of tariff protection, there is one of direct and positive assistance. This preference is based on several rational factors.

Policy on foreign capital inflows

13.39 A policy on inflow of foreign capital ideally may include the following basic elements:

- a) no foreign investment is permitted in purely trading and commercial activities;
- b) foreign capital is welcome in production activities including agriculture, mining, fishing, and manufacturing. However, in the case of packaging, assembly conversion and reprocessing, only selective inflow is to be considered;
- c) the selective inflow of capital is subject to an appraisal by a foreign investments committee;
- d) a definite limit governs the foreign component of

voting capital in any industrial undertaking which may be 49 per cent.* Special cases are permitted in which the foreign voting capital may exceed the limit but such cases are examined by a high power committee;

- e) a provision for the progressive dilution of foreign investments is made for special cases under which more than 49 per cent participation is permitted. However, there is no need for obligatory dilution of foreign capital in normal cases of minority foreign investments, since such a provision sometimes takes away the inducements imparted to the inflow of foreign investments;
- f) in the law or policy statement governing foreign investments, special care should be taken to define 'voting capital'. Enterprises, with long and varied experience of international activity, often devise terminology in contracts and covenants which circumvent ingeniously the spirit of the law. The domestic capital must carry rights so that the local investors are able to participate effectively in business decision-making;
- g) transfers of capital from one foreign investor to another in which more than 49 per cent capital participation is permitted, are made subject to the same procedure as are applicable to the original clearance;
- h) to ensure that decision on foreign investments does not get entangled in administrative red tape, which is the experience of many developing countries, definite time limits for decision-making by officials and committees should be prescribed;
- i) bilateral or multilateral governmental investments may be kept outside the purview of the foregoing policy guidelines. However, the participation of private foreign capital in public corporations/projects should,

* A commercial law is now under consideration which is understood to provide for such a limit.

normally, be subject to the same guidelines which are applicable to the private sector.

13.40 The law/regulations/policy governing foreign investments should be publicised extensively so that 'preferred' foreign investors may be induced to participate in priority industrial ventures in UAE. It has been observed often that less attractive foreign investments (which do not carry high level technology and expertise) take advantage of the opportunities available and preferred sources shy away from the industrial activity in the developing countries.

Industrial financing

UAE Development Bank

13.41 The United Arab Emirates Development Bank (UAEDB) was established in 1974. The operations of the Bank were to cover real estate (which has been until now its main concern), agriculture, fishery and live-stock and light industries. The limit of financial assistance is limited to Dh 3 million per individual.

13.42 If the Bank is to serve as a powerful instrument for the promotion of industrial programmes, investigation and restructuring of the bank's policies should be undertaken. An industrial financing instrument can play a very significant role in UAE. In view of the fact that the light industries, by and large, use relatively large amounts of manpower, it is doubtful if the operations of the bank should be limited to smaller amounts of assistance, which is the policy at the present. Encouragement of light industries without an adequate provision of assistance to larger industrial units, will defeat the basic objectives of an industrial strategy most appropriate to UAE.

13.43 The operation of an industrial bank should be broad-based and should provide medium- and long-term assistance to industry on well-defined terms.

13.44 It is recommended that the functions of industrial financing, which have their own distinct character and which demand special expertise, should be segregated from financing of other developmental activities. An industrial financing organisation, by whatever name* called, should be established at an early date. Some of the preferred conditions of its operations should be:

* In this report, for the sake of FIFO (Federal Industrial Financing Organisation) has been used to distinguish it from the present development bank.

- a) the limit to the assistance provided by FIFO should be high and should be related to the project requirements and not to individuals;
- b) financing, ideally, should be provided to joint stock (shareholders limited liability) companies with public participation. Higher limits of financing norms for joint stock companies would achieve this purpose. Thus, if FIFO is to finance a project owned and controlled by an individual, up to 50 per cent of the project cost should be financed but if the same project is owned by a joint stock company with public participation of not less than 10 per cent of the equity capital, the limit should be raised to 80 per cent;
- c) financial assistance to the project should form a mixed package, composed of equity participation, loan financing and guarantees, where necessary;
- d) for purposes of financing of projects, norms of operations should be devised, such as the preferred equity-debt ratio;
- e) the cost of financing charged by FIFO should be low and based on a graduated regressive scale, in which rates decline with increases in capital.

13.45 The FIFO financing should be on a 'soft lending' basis. The three components of soft lending are long maturity periods, low cost, and a fairly long grace period. However, long maturity periods in the case of industrial financing is not necessary since the pay-back periods should be short. An industrial financial institution need not wait for the repayment of the resources supplied by it beyond the pay-out periods of projects. If it receives back the resources lent, they will help to finance other projects.

13.46 To increase its financial resources, FIFO should float bonds of its own and resort to joint financing with other financial institutions in UAE and abroad.

13.47 FIFO should not limit its activities only to direct financing-participation in equity, loans and guarantees. It should extend its functions to serve as a catalytic agent in promoting mobilisation of private savings and in re-directing these to the manufacturing sector. FIFO can play a positive role in the organisation of a stock exchange market, which will help it to finance industry more effectively since it will have the facilities to liquidate its holdings of stocks at an appropriate stage. FIFO should also assist in channeling industrial growth in the preferred directions by giving preferential treatment to more acceptable industrial ventures.

Abu Dhabi fund for Arab Economic Development

13.48 The Abu Dhabi Fund for Arab Economic Development should develop into a major instrument illustrating the doctrine of 'extended industrialisation' or 'industrialisation by proxy'. It should act as a catalytic agent in promoting industrial investments abroad.

13.49 The basic objective of the Fund is to extend financial assistance to Arab, African and Asian countries for the development of their economies by means of loans and subscription of capital in development projects and by way of technical assistance for surveys, studies and technological development.

13.50 It has a capital of Dh 2,000 million. The allocated resources are currently committed. The Fund has extended assistance mainly by way of loans except in one case.

13.51 Upto 1976, some 27 loan agreements had been signed with a total involvement of Dh 1,065 million. Seven of these were related to industry. The amount of loans granted to industry aggregated to Dh 330 million constituting 31 per cent of the total assistance. Loans are given on easy terms with the interest charge being between 3 and 5 per cent.

13.52 The 1976 portfolio included the following in the field of manufacturing industries:

<u>Country</u>	<u>Loan</u> <u>(million Dh)</u>	<u>Term</u> <u>(years)</u>	<u>Interest</u> <u>(% p.a.)</u>	<u>Purpose</u>
Bahrain	60.0	13	4.5	To finance small industries including studies
Sudan	80.0	12	4.5	To finance a cotton spinning mill
Morocco	70.0	11	5.0	To finance two spinning mills. Project cost: Dh 1985 million
Egypt	18.4	16	4.0	To finance nitrogenous fertiliser plant. Capacity: 249,000 tons per year. Project cost: Dh 514 million
Malaysia	17.0	15	4.0	To finance an integrated palm oil project including fruit processing plant
	16.0	15	4.0	To finance a fodder and flour mill. Project cost: Dh 57 million
Bangladesh	40.0	13	4.0	To finance the completion of a tools and equipment factory. Project cost: Dh 200 million

13.53 Loan agreements for industrial projects concluded in 1977 constituting 34.5 per cent of the assistance transacted during the year were as follows:

<u>Country</u>	<u>Project</u>	<u>Loan (million Dh)</u>
Tunisia	Al Hassa Phosphate (Phase I)	100.00
Afghanistan	Sugar Factory	30.00
Tanzania	Sugar Factory	24.00
Mauritania	Steel Bar Rolling Mill	16.00
Guinea	Grinding Plant	16.00
		<hr/> 186.00 <hr/>

13.54 The Fund should examine whether its participation should be geared basically to direct participation both in financing and management and if it can also act as an agency for channelling private industrial investment abroad. It could act as a guide to individual investors and in organising joint ventures.

Investment guarantees

13.55 In view of the need for extended industrialisation, an organisation which could guarantee investments from UAE and other member countries outside their respective countries, should be promoted. An additional institution will be necessary only if it is not found feasible to extend the activities of the Inter-Arab Investment Guarantee Corporation to non-Arab countries in which investments from UAE and other member countries have to be protected.

Labour policy

13.56 It is not within the scope of the terms of reference of the present UNIDO mission to deal with the problems and policies of immigration. Nonetheless, it is obvious that the present practices of contracting labour for specific jobs for short term periods, denies the country the benefit of optimal productivity commensurate with the cost paid by the employer, whether he be an individual, a corporation or an official organisation.

13.57 It is understood that the present labour and personnel policies are governed only by individual service contracts, the contents of which vary widely. There is no labour law, let alone a uniform one for UAE. The Emirate of Abu Dhabi does have some regulations. A new labour law has been drafted. It is now under examination.

13.58 The socio-economic conditions under which immigrant labour lives do not contribute to motivations which help to increase the involvement of workers and to induce them to make the best contributions to productivity. Since UAE will have to depend, for quite a time, on immigrant work force, some policy of stabilisation will have to be promoted in the interest of more productive and profitable industrial activity. It is hoped that the government will soon formulate a clear, well-defined policy in this regard, which is a pre-requisite for industrialisation on the scale envisaged in the present study.

13.59 The Ministry of Planning has commissioned the International Bank of Reconstruction and Development (IBRD) for a Critical Skills Survey. This is a very welcome move. This will quantify the demand-supply conditions as they are developing and would develop in the near future and, in the process, will help planning in a very vital, almost critical, area of industrial development.

13.60 The quantitative exercise, however, needs to be extended in less tangible but even more significant areas: the social and behavioural patterns of the working force: the analysis of the productivities, the aggregate costs, their social and economic motivations, the factors responsible for low productivities, the measures to stimulate and promote higher contributions. This may lead to higher effectiveness for the following factors:

- a) recruitment methods and practices;
- b) selection of labour force by social background, work experiences and work involvement;
- c) work compensation patterns;
- d) contractual elements;
- e) assimilation of the expatriate work force;
- f) personnel policies relating to mobility of work and transferability within and between organisations, rewards and penalties;

Policy for industrial areas

13.61 A basic pattern for the development of industrial areas should be designed. There is enough experience available from several developing countries to warrant this. In fact, if some of the errors of industrialisation made by the industrialised countries have to be avoided, it is an imperative. The experience in UAE itself should lead to planned approach. Industrial units in some areas have been established without any transportation or communication facilities. In one case, as it was pointed out, an area with units manufacturing food products is located close to a city dumping ground.

13.62 Even the supply of power has followed rather than preceded the establishment of industries in some areas. In one case, it was found that a small unit (manufacturing polythene bags) installed a generating unit of its own and now that the power is available from the town supply source, the entire generating unit has become redundant. This involved a major investment component.

13.63 The elements of a policy on industrial zones should include:

- a) categorisation of the areas according to overall size, plot sizes and facilities provided;
- b) a master lay-out plan;
- c) planning and development of infra-structural facilities including site development, water, power, roads, repairs and maintenance, storage and warehousing, effluent disposal;
- d) management, inspection and regulation.

13.64 This does not mean that the areas should be uniform in terms of plot sizes or facilities provided. In fact, the categorisation itself denotes that the areas are to be planned suitably according to the respective requirements of the areas. Consideration should be given to specialised industrial areas, such as for building materials industries, electronics industries, food industries. This will facilitate provision of common facilities and will tend to make the industrial units more competitive.

Standardisation

13.65 It is time now that UAE adopts a definite and uniform approach to standardisation and metric system. Once substantial advances have been

made, it would be difficult to switch over to a new system. In most cases, International Standard Specifications may be adopted. Where necessary, BSS may be preferred. It would, however, be least expensive to standardise on a system of standardisation. The UNDP country programme of UAE includes the recruitment of an expert in quality control and standardisation and specially to develop the necessary institutional arrangements.

Consultancy services

13.66 A major problem area is the use of consultancy services. Many industrial companies in UAE have faced serious problems on the selection and use of services of external consulting firms, which either do not have the competence claimed by them in the subject specialisation or provide misleading professional advice. A roster of acceptable consultancy services should be prepared giving necessary details of the internationally operating consultancy organisations. Advice may also be imparted to industrial promoters in appraising the capability of consultants.

13.67 It has often been noticed that consultants are better evaluated by the work actually done by them for comparable projects rather than by their size. High level of expertise should be deployed to appraise the work of consultants. This function may be performed by the proposed industrial assistance centre.

Industrial policy statement

19.68 An industrial law is a basic document defining responsibilities and obligations for those involved in industrial activities. It spells out the procedures and prohibitions besides laying down a few fundamental policy parameters, such as restrictions on inflow of foreign capital. The law is expected to lay down policy guidelines for the direction that industrialisation should take during a given stage of development. A national industrial policy statement is a significant step as a follow-up measure.

13.69 An industrial policy statement in UAE should, among others, seek to define in clear and unequivocal terms the following:

- a) the precise role industrialisation is assigned to play in the overall economic growth pattern;
- b) the nature of industrialisation which is sought to be promoted;
- c) the strategy for industrial development;
- d) the industrial sub-sectors in which foreign capital, within the limits prescribed under law, is encouraged and the subsectors in which it is to be discouraged;
- e) the policy objectives on import and transfer of technologies and restraints thereon;

- f) the preferred policy on industrial structure including size-structure;
- g) the basics of employment and labour policy;
- h) the preferred aims of industrial dispersal;
- i) the nature of incentives/concessions which private enterprise can expect from the State;
- j) the measures for protection of national capital and enterprises against unfair competition from abroad;
- k) the role of regional and international cooperation on bilateral and multilateral bases including those with other sister developing countries;
- l) policy on institutional infra-structure and the preferred conditions under which the State will support promotion of UAE investments abroad.

Policy implementation: international cooperation

13.70 International cooperation in various areas of policy formulation and implementation may be sought from international agencies such as UNIDO and and regional agencies such as IDCAS.

13.71 The regional and international institutions can be helpful particularly in establishing institutional infra-structure. With the industrialisation programme envisaged during the next two decades, it is imperative that appropriate and efficient institutional network be created with the necessary specialisations.

Annex 1

DISTRIBUTION OF INDUSTRIAL ESTABLISHMENTS,
BY INDUSTRY AND EMIRATES,
1977

ISIC NO.	Industrial Classification	AD	DB	SH	AJ	AQ	RK	FJ	TOTAL	PER CENT
31	Food & beverages	15	15	7	3	-	2	-	42	8.4
32	Textiles & leather	21	39	4	2	2	2	-	70	14.0
33	Wood & wood products	15	28	23	11	1	5	2	85	17.0
34	Paper products & printing	16	13	3	6	-	2	-	40	8.0
35	Petroleum & chemicals	5	7	7	-	-	1	-	20	4.0
36	Non-metallic mineral-based products	27	47	24	15	3	9	2	127	25.3
37	Basic metals	1	-	1	-	-	-	-	2	0.4
38	Metal working & machinery	24	44	20	6	2	9	1	106	21.2
39	Unclassified industries	1	6	2	-	-	-	-	9	1.8
TOTAL		125	199	91	43	8	30	5	501	100.0
PER CENT		25.0	39.7	18.2	8.6	1.6	6.0	1.0	100.0	

Annex 2

DISTRIBUTION OF MANPOWER, BY INDUSTRY
AND EMIRATES,
1977

ISIC NO.	Industrial Classification	AD	DB	SH	AJ	AQ	RK	FJ	TOTAL	PER CENT
31	Food & beverages	481	1,538	373	98	-	78	-	2,568	12.8
32	Textiles & leather	318	444	53	59	25	16	-	915	4.6
33	Wood & wood products	316	836	627	183	4	84	36	2,086	10.4
34	Paper products & printing	802	676	64	114	-	47	-	1,703	8.5
35	Petroleum & chemicals	829	336	382	-	-	35	-	1,582	7.9
36	Non-metallic mineral-based products	822	1,562	836	534	64	1,149	38	5,005	25.0
37	Basic metals	142	-	14	-	-	-	-	5,156	0.8
38	Metal working & machinery	1,635	2,905	733	165	23	209	12	5,682	28.4
39	Unclassified industries	63	185	91	-	-	-	-	339	1.7
TOTAL		5,408	8,482	1,173	1,153	116	1,618	86	20,036	100.0
PER CENT		27.0	42.3	15.8	5.8	0.6	8.1	0.4	100.0	

Annex 3

DISTRIBUTION OF MANPOWER, BY EMPLOYMENT CATEGORY
AND EMIRATES,

1977

(In percentages)

Emirate	Management/Commercial		Technicians/ Engineers	Workers			TOTAL		
	Management	Clerical		Total	Skilled	Semiskilled		Unskilled	
Abu Dhabi	3.9	6.2	10.1	8.0	45.2	19.6	17.1	81.9	100.0
Dubai	3.0	5.7	8.7	4.7	38.2	24.0	24.4	86.6	100.0
Sharjah	4.2	5.9	10.1	4.5	38.7	21.0	25.6	85.3	100.0
Ajman	6.2	2.6	8.8	3.1	41.0	28.6	18.4	88.0	100.0
Umm al Quwain	8.6	2.6	11.2	0.9	22.4	24.1	41.4	87.9	100.0
Ras al Khaimah	2.5	5.2	7.7	6.5	60.2	6.9	18.7	85.8	100.0
Fujeirah	4.7	2.3	7.0	3.5	30.2	30.2	29.1	89.5	100.0
TOTAL	3.6	5.6	9.2	5.6	42.0	21.3	21.9	85.1	100.0

Annex 4

GROWTH OF INDUSTRIAL OUTPUT, BY INDUSTRY,
1977

ISIC NO.	Industrial Classification	Number of establish- ments	Output (million Dh)					Production index					
			1973	1974	1975	1976	1977	1973	1974	1975	1976	1977	
31	Food & beverages	42	19	36	54	160	249	8	15	22	64	100	
32	Textiles & leather	70	4	5	9	13	34	12	14	27	37	100	
33	Wood & wood products	85	33	30	52	75	119	27	25	44	63	100	
34	Paper products & printing	40	18	24	46	68	119	15	20	39	57	100	
35	Petroleum & chemicals	19	2	2	11	149	346	1	1	3	43	100	
36	Non-metallic mineral-based products	125	20	31	51	178	490	4	6	10	36	100	
37	Basic metals	2	-	-	-	-	4	-	-	-	-	100	
38	Metal working & machinery	105	107	156	239	326	675	16	23	35	48	100	
39	Unclassified industries	9	N	N	3	12	90	N	N	4	14	100	
TOTAL			497	202	284	465	981	2,128	10	13	22	46	100

N = negligible.

Annex 5

DISTRIBUTION OF GROSS VALUE OF INDUSTRIAL SALES,
BY INDUSTRY AND EMIRATES,

1977

(Million Dh)

ISIC NO.	Industrial Classification	Number of establishments	AD	DB	SH	AJ	AQ	RK	FJ	TOTAL	PER CENT
31	Food & beverages	42	42.9	136.8	17.0	21.8	-	6.8	-	225.4	11.9
32	Textiles & leather	42	5.0	10.6	1.0	2.6	0.4	1.0	-	20.0	1.1
33	Wood & wood products	85	18.7	38.2	29.9	13.0	N	3.7	2.2	106.0	5.6
34	Paper products & printing	40	45.8	51.8	6.5	6.7	-	1.5	-	112.4	6.0
35	Petroleum & chemicals	19	199.1	66.1	41.8	-	-	5.0	-	312.1	16.5
36	Non-metallic mineral-based products	122	77.0	82.2	112.7	20.0	2.7	96.9	1.8	393.6	20.8
37	Basic metals	2	1.0	-	N	-	-	-	-	1.0	0.1
38	Metal working & machinery	102	240.2	203.4	175.6	6.0	1.0	9.8	N	636.5	33.7
39	Unclassified industries	8	3.6	71.5	7.6	-	-	-	-	82.8	4.4
TOTAL		462	633.3	660.9	392.3	70.2	4.3	124.6	4.4	1890.1	100.0
PER CENT			33.5	35.0	20.8	3.7	0.2	6.6	0.2	100.0	
Number of establishments		462	110	179	90	43	7	28	5		

N = negligible.

Annex 6

DISTRIBUTION OF GROSS VALUE OF INDUSTRIAL OUTPUT,
BY INDUSTRY AND EMIRATES,
1977

(In percentages)

ISIC NO.	Industrial Classification	Number of establish- ments	AD	DB	SH	AJ	AQ	RK	FJ	TOTAL
31	Food & beverages	42	17.2	56.2	7.6	13.6	-	5.4	-	100.0
32	Textiles & leather	70	40.8	45.2	2.5	8.4	1.3	1.8	-	100.0
33	Wood & wood products	85	17.3	33.2	30.9	13.5	0.1	3.2	1.9	100.0
34	Paper products & printing	40	38.7	44.4	9.2	6.4	-	1.3	-	100.0
35	Petroleum & chemicals	19	57.5	20.6	20.4	-	-	1.4	-	100.0
36	Non-metallic mineral-based products	125	16.5	19.0	23.7	4.4	0.7	35.4	0.4	100.0
37	Basic metals	2	89.4	-	10.6	-	-	-	-	100.0
38	Metal working & machinery	105	35.6	33.9	26.3	1.0	0.1	2.9	-	100.0
39	Unclassified industries	9	7.1	82.4	10.6	-	-	-	-	100.0
TOTAL		497	30.8	33.6	20.8	4.2	0.2	10.2	0.2	100.0

Annex 7

DISTRIBUTION OF INDUSTRIAL INVESTMENTS,
BY INDUSTRY AND EMIRATES,

1977

ISIC NO.	Industrial Classification	(Million Dh)										TOTAL	PER CENT	
		AD	DB	SH	AJ	AQ	RK	FJ						
31	Food & beverages	24.1	101.1	43.7	17.5	-	5.2	-	191.8	8.4				
32	Textiles & leather	1.4	3.5	0.5	1.9	-	N	-	7.5	0.3				
33	Wood & wood products	10.7	30.4	35.5	5.4	-	0.6	1.7	84.6	3.7				
34	Paper products & printing	75.5	56.7	23.6	6.5	-	2.2	-	164.8	7.2				
35	Petroleum & chemicals	112.0	27.9	48.6	-	-	2.1	-	190.7	8.4				
36	Non-metallic mineral-based products	175.0	92.5	231.6	11.4	5.2	579.5	5.7	1,101.1	48.3				
37	Basic metals	31.0	-	3.7	-	-	-	-	34.7	1.5				
38	Metal working & machinery	132.2	169.4	56.3	4.8	0.3	40.3	0.8	404.5	17.8				
39	Unclassified industries	69.2	12.4	17.0	-	-	-	-	98.8	4.3				
TOTAL		631.6	494.3	460.9	47.7	5.7	630.2	8.3	2,278.8	100.0				
PER CENT		27.7	21.7	20.2	2.1	0.3	27.7	0.4	100.0					

Annex 8

STRUCTURE OF INDUSTRIAL INVESTMENTS,
BY INDUSTRY,

1977

(Million Dh)

ISIC NO.	Industrial Classification	Capital	Bank Borrowings	Other Borrowings	Capital Subsidy	Total Investment
31	Food & beverages	121.4	30.7	15.5	24.0	191.8
32	Textiles & leather	6.4	5.0	1.0	4.0	7.5
33	Wood & wood products	58.9	19.0	N	6.5	84.6
34	Paper products & printing	90.4	43.7	2.9	27.7	164.8
35	Petroleum & chemicals	134.9	51.3	4.4	-	190.7
36	Non-metallic mineral-based products	773.6	291.2	14.7	21.5	1,101.1
37	Basic metals	34.7	N	N	-	34.7
38	Metal working & machinery	303.2	86.6	8.3	6.3	404.5
39	Unclassified industries	82.8	9.7	5.2	1.0	98.8
TOTAL		1,606.7	533.0	51.4	87.6	2,278.8

N = negligible.

Annex 2

STRUCTURE OF CAPITAL AND BANK BORROWINGS,
BY INDUSTRY,

1977

(Million Dh)

ISIC NO.	Industrial Classification	C A P I T A L		B A N K B O R R O W I N G S				
		Local private	Local government eign	Long Term	Short Term	Total		
31	Food & beverages	87.5	15.3	18.6	121.4	6.7	24.0	30.7
32	Textiles & leather	2.0	-	4.4	6.4	4.0	1.0	5.0
33	Wood & wood products	24.4	-	34.4	58.9	13.4	5.5	19.0
34	Paper products & printing	70.0	3.4	16.8	90.4	22.8	20.8	43.7
35	Petroleum & chemicals	5.3	66.9	62.7	134.9	35.8	15.4	51.3
36	Non-metallic mineral-based products	135.1	385.8	252.7	773.6	197.1	94.0	291.2
37	Basic metals	-	31.0	3.7	34.7	-	N	N
38	Metal working & machinery	102.1	2.2	198.8	303.2	62.0	24.6	86.6
39	Unclassified industries	3.7	71.6	7.4	82.8	7.5	2.1	9.7
TOTAL		430.4	576.4	599.8	1,606.7	346.0	187.0	533.0

N = negligible.

Annex 10

TURNOVER RATIO OF INDUSTRIAL WORKERS,
BY EMIRATES,

1977

Emirate	Number of establishments	Skilled Workers	Semi-skilled Workers	Unskilled Workers	Total
Abu Dhabi	125	14.9	13.8	21.9	16.1
Dubai	199	14.7	10.0	8.4	11.6
Sharjah	91	18.3	18.3	21.1	19.1
Ajman	43	16.5	19.7	32.5	20.9
Umm al Quwain	8	-	-	-	-
Ras al Khaimah	30	8.2	20.5	21.9	12.2
Fujeirah	5	61.5	61.5	28.0	50.6
TOTAL	501	14.7	13.5	15.7	14.7

Annex 11

COST OF POWER, BY INDUSTRY
AND EMIRATES,

1977

(Thousand Dh)

ISIC NO.	Industrial Classification	Number of establishments	AD	DB	SH	AJ	AQ	RK	FJ	TOTAL	PER CENT
31	Food & beverages	39	1,102	1,905	74	39	-	15	-	3,135	22.1
32	Textiles & leather	63	172	171	4	-	2	8	-	357	2.5
33	Wood & wood products	74	101	286	175	46	1	27	6	642	4.5
34	Paper products & printing	38	321	531	38	60	-	10	-	960	6.8
35	Petroleum & chemicals	15	78	444	83	-	-	10	-	615	4.3
36	Non-metallic mineral-based products	100	431	1,219	3,119	85	2	305	8	5,169	36.4
37	Basic metals	2	252	-	7	-	-	-	-	259	1.8
38	Metal working & machinery	88	1,329	961	183	11	1	87	6	2,578	18.1
39	Unclassified industries	9	260	214	20	-	-	-	-	494	3.5
TOTAL		428	4,046	5,731	3,703	241	6	462	20	14,209	100.0
PER CENT			28.5	40.3	26.1	1.7	0.0	3.3	0.1	100.0	
Number of establishments		428	95	189	81	27	6	25	5		

Annex 12

DISTRIBUTION OF LAND, BY INDUSTRY
AND EMIRATES,

1977

(Thousand ft²)

ISIC NO.	Industrial Classification	Number of establishments	AD	DB	SH	AJ	AQ	RK	FJ	TOTAL	PER CENT
31	Food & beverages	29	372	667	179	172	-	820	-	2,210	11.0
32	Textiles & leather	8	4	2	-	286	2	-	-	294	1.5
33	Wood & wood products	73	207	421	621	165	1	15	91	1,521	7.5
34	Paper products & printing	33	105	264	303	65	-	1	-	738	3.7
35	Petroleum & chemicals	17	909	845	79	-	-	100	-	1,933	9.6
36	Non-metallic mineral-based products	116	1,264	2,888	1,519	1,006	200	1,433	113	8,423	41.8
37	Basic metals	2	216	-	40	-	-	-	-	256	1.3
38	Metal working & machinery	97	948	1,888	455	194	21	462	14	3,982	19.8
39	Unclassified industries	7	360	230	199	-	-	-	-	789	3.9
TOTAL		382	4,385	7,205	3,395	1,888	224	2,831	218	20,146	100.0
PER CENT			21.8	35.8	16.9	9.4	1.1	14.1	1.1	100.0	
Number of establishments		382	93	151	61	42	7	23	5		

Annex 13

FLOOR AREAS OF INDUSTRIAL ESTABLISHMENTS,
BY INDUSTRY AND EMIRATES,

1977

(Thousand ft²)

ISIC NO.	Industrial Classification	Number of establishments	AD	DB	SH	AJ	AQ	RK	FJ	TOTAL	PER CENT
31	Food & beverages	33	116	1,152	66	92	-	24	-	1,450	18.9
32	Textiles & leather	12	4	7	-	1	2	-	-	14	0.2
33	Wood & wood products	73	88	325	242	96	1	339	17	1,108	14.5
34	Paper products & printing	32	79	168	12	42	-	1	-	302	3.9
35	Petroleum & chemicals	17	78	157	205	-	-	12	-	452	5.9
36	Non-metallic mineral-based products	96	195	607	572	402	22	115	2	1,915	25.0
37	Basic metals	1	56	-	-	-	-	-	-	56	0.7
38	Metal working & machinery	94	640	897	364	27	8	174	14	2,124	27.7
39	Unclassified industries	6	81	145	17	-	-	-	-	243	3.2
TOTAL		364	1,337	3,458	1,478	660	33	665	33	7,664	100.0
PER CENT			17.4	45.1	19.3	8.6	0.4	8.7	0.4	100.0	
Number of establishments		364	80	147	63	40	8	21	5		

Annex 14

IMPORTS OF BUILDING MATERIALS IN ABU DHABI AND DUBAI,

1976

(Thousand tons)

Product Code	Product	Abu Dubai	Dubai	Total
243.1	Timber	-	192.0	192.0
243.2	Lumber, sawn and planed	24.8	0.6	25.4
243.3	Other wood	24.9	-	24.9
273.1	Marble, unworked	0.5	1.6	2.1
273.2	Gypsum	3.1	6.9	10.0
273.3	Sand	0.4	2.3	2.7
273.4	Mosaics	0.7	13.2	13.9
273.5	Others	-	0.7	0.7
276.2	Asbestos	5.1	3.3	8.4
276.4	Mica	-	20.0	20.0
533.3	Prepared paints	5.2	7.8	13.0
581.7	Plastic/vinyl floor	-	1.3	1.3
581.8	Plastic/vinyl tiles	-	1.2	1.2
581.9	Vinyl plastic walls	-	0.5	0.5
631.1	Veneer sheets	0.5	0.4	0.9
631.2	Plywood	10.4	63.5	73.9
631.4	Impr. or reconst. wood	1.9	-	1.9
631.8	Wood, simply shaped	0.7	-	0.7
632.4	Builder's woodwork	0.6	-	0.6
632.7	Work for decorative use	0.3	-	0.3
657.1	Linoleum & alike	0.6	0.1	0.7
661.2	Cement	573.9	-	573.9
661.3	Building stone	8.7	-	8.7
661.6	Sheets of asbestos cement	-	3.4	3.4
661.7	Tiles asbestos cement	-	0.6	0.6
662.2	Ceramic wall tiles	-	25.6	25.6
662.3	Refractory const. mat.	0.2	16.5	16.7
662.4	Ceramic bricks, etc.	23.7	1.8	25.5
663.3	Acoustic tiles	-	1.5	1.5
663.5	Insul. mineral mat.	0.8	0.5	1.3
663.6	Manuf. of mineral mat.	9.6	-	9.6
663.8	Manuf. of asbest. mat.	0.0	0.0	0.0
663.9	Articles of ceramic mat.	0.6	-	0.6
664.3	Sheet glass, unworked	1.4	0.8	3.2
664.6	Bricks, tiles of glass	0.7	-	0.7
664.9	Glass (not table ware)	0.3	-	0.4

continued

Annex 14 (cont.)

Product Code	Product	Abu Dhabi	Dubai	Total
673.2	Bars & rods of iron or steel	150.3	331.1	481.4
673.6	Mild steel beams	-	6.3	6.3
674.3	Galvanised iron sheets	-	11.6	11.6
678.1	Tubes & pipes of iron	18.9	11.9	30.8
682.2	Copper tubes, pipes etc.	-	0.2	0.2
684.4	Aluminium sheets	2.5	2.0	4.5
691.1	Windows and doors	11.4	2.6	14.0
691.2	Prefab. build. of iron	1.3	21.9	23.2
691.3	Scaffolding equipment	-	6.2	6.2
691.4	Other prefab. irons	-	17.5	17.5
691.5	Windows and doors of aluminium	-	0.3	0.3
691.6	Other finished parts of aluminium	-	0.3	0.3
694.1	Nails, tacks etc.	4.3	-	4.3
697.1	Domestic stoves, cookers	0.4	-	0.4
718.4	Construction & mining machinery	11.1	-	11.1
718.5	Mineral crushing, sorting & moulding	5.2	-	5.2
725.0	Domestic electrical equipment	3.4	-	3.4
812.2	Sinks, wash basins, baths (ceramic)	2.6	-	2.6
812.3	Sinks, wash basins, baths (iron or steel)	0.5	-	0.5
812.4	Lighting fixtures & fittings	3.6	-	3.6

Sources: Abu Dhabi Customs Department:
Yearly Bulletin 1976.
Government of Dubai, Statistics Office:
Statistical Report, 1976.

Annex 15

IMPORTS OF SELECTED FOOD PRODUCTS IN ABU DHABI AND DUBAI,
1976

(Thousand tons)

Product	Abu Dhabi	Dubai	Total
Fish—fresh, chilled and frozen	58	482	540
Fish—salted or smoked	17	n.a	17
Fish—canned	922	5,813	6,735
Dried fruits (dates, and others)	1,423	1,126	2,549
Tomato puree	n.a	6,707	6,707
Jam, marmalade (mango, citrus)	881	1,298	2,179
Fruits and vegetable juice (tomato, mango, citrus)	3,852	24,950	28,802
Poultry	4,985	16,793	21,778
Other prepared or preserved meat, sausages and others	182	1,762	1,944
Eggs	4,825	4,242	9,067
Non-alcoholic beverages	3,643	9,261	12,904
Milk powder	2,500	4,112	6,612
Wheat flour	6,935	69,084	76,019
Biscuits and wafers	1,063	3,170	4,233
Pasta products	1,128	3,312	4,440
Cereal snacks	578	607	1,185
Fresh meat	5,410	1,137	6,547
Chocolate and chocolate preparations	462	715	1,177
Sugar confectionery	320	4,109	4,429
Chewing gum	n.a	1,115	1,115
Nuts (almond, peanut, others)	181	290	471
Sugar, refined	1,576	13,953	15,529
Sugar, cube	n.a	1,045	1,045
Rice	736	53,560	54,296
Dried beans, chick peas	n.a	4,578	4,578
Spices	1,625	353	1,978
Green and roasted coffee	132	1,979	2,111
Tea	1,594	6,606	8,500
Animal feed	180	9,906	10,086
Vegetable oil and fats	n.a	11,334	11,334

continued

Annex 15 (cont.)

Product	Abu Dhabi	Dubai	Total
Infant foods	250	536	786
Frozen vegetables	986	550	1,536
Pickles (vegetables)	n.a	742	742
Canned vegetables	2,314	15,146	17,460
Canned fruits	132	4,913	5,045
Cheese and curd	1,640	1,987	3,627
Beer	2,748	n.a	2,748
Cigarettes	1,242	4,554	5,796

Sources:

Abu Dhabi Customs Department:
Yearly Bulletin, 1976.

Government of Dubai, Statistics Office:
Statistical Report, 1976.



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