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PANEL OF INDUSTRIAL EXPERTS ON THE
PETROCHEMICAL INDUSTRY

Vienna, 20 and 21 June 1977

REPORT OF THE MEETING ^{1/}

^{1/} This report has been reproduced without formal editing.

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- ii -
F1872

TABLE OF CONTENTS

	<u>Pages</u>
INTRODUCTION	iii
REPORT OF THE MEETING	
Purpose of the first consultation meeting on the petrochemical industry	1
Range of petrochemical products to be covered at the consultation meeting	1 - 2
The use of petrochemical products to complement the use of natural products	2 - 3
Factors important for establishing a petrochemical industry in developing countries	3 - 5
International co-operation in developing the petrochemical industry	5 - 6
The share of developing countries in world output of petrochemicals	6 - 7
Other issues suggested for consideration at the consultation meeting	7 - 8
ANNEX A Illustrative list of developing countries grouped in five categories based on natural gas resources, crude oil resources and the size of the domestic market for petrochemicals	9
ANNEX B Discussion paper prepared by the UNIDO Secretariat for the Panel Meeting	10 - 14
ANNEX C Topics and issues considered at consultation meetings on other industrial sectors	15 - 18
ANNEX D List of Participants	19 - 21
ANNEX E List of UNIDO staff members responsible for preparing for consultations on the petro- chemical industry	22

INTRODUCTION

The Second General Conference of UNIDO held at Lima, Peru in March 1975 recommended that UNIDO should include among its activities a system of continuing consultations at global, regional and sectoral levels. UNIDO should be prepared to serve as a forum for negotiation of agreements in the field of industry between developed and developing countries and among developing countries themselves at the request of the countries concerned.

The General Assembly, at its seventh special session in September, 1975, decided that the system of consultations as provided for in the Lima Declaration and Plan of Action should be established; its purpose should be to facilitate the achievement of the goals set forth in industrialization, including the redeployment of existing capacities in developed countries and the creation of new capacities in developing countries.

The evolution of the system of continuing consultations takes place under the guidelines of the Industrial Development Board, UNIDO's governing body. It has decided that consultations should be organized first on industrial sectors and that participants from interested countries should include officials of Governments as well as representatives of industry, labour, consumer groups etc.

In January and February 1977, first consultation meetings were convened by UNIDO on the fertilizer industry and on the iron and steel industry. Later in 1977, first consultation meetings will be convened on the leather and leather products industry and the vegetable oils and fats industry.

The Industrial Development Board decided in May 1977 that it would consider at its next meeting in May 1978 on which two additional sectors consultation meetings would be convened. In the meantime, UNIDO was asked to continue its preparations for convening consultation meetings on the following sectors of industry:

- Petrochemicals
- Pharmaceuticals
- Capital Goods
- Agricultural Machinery
- Agro-based Industries

UNIDO convened the panel of industrial experts in Vienna on 20 and 21 June 1977 as a first step in making preparations for a consultation meeting on the petrochemical industry.

The experts were asked to consider the range of petrochemical products that might be considered at the first consultation meeting and questions in four other basic areas of special importance to this industry; the discussion was based on a paper prepared by the UNIDO Secretariat that is attached as Annex B.

The experts were also invited to consider whether issues which had been considered at the first consultation meetings on (a) the fertilizer industry and (b) the iron and steel industry, would need to be considered at the first consultation meeting on the petrochemical industry. The paper summarizing these issues that was prepared for the meeting is attached as Annex C.

The Panel felt that the prospects for establishing a petrochemical industry in developing countries varied from country to country. Developing countries could be grouped into five categories depending on the raw materials available and the size of domestic market. Examples of developing countries falling in each of these five categories are given in Annex A.

The Report of the Panel identifies the factors which are important for establishing a petrochemical industry in developing countries and advises UNIDO on a number of issues that might be considered at the first consultation meeting on the petrochemical industry.

The meeting was attended by the 15 participants listed in Annex D. The UNIDO staff members who made preparations for the meeting are listed in Annex E.

REPORT OF THE MEETING

Purpose of the First Consultation Meeting on the Petrochemical Industry

1. The consultation meeting is intended to help the developing countries achieve their industrialization goals through the establishment of new production capacities in the petrochemical industry. The successful operation of new production capacities requires raw materials and markets.
2. The Panel felt that in considering the questions it was asked to discuss by the UNIDO Secretariat (Annex B), the different circumstances of developing countries had to be kept in mind. It would therefore be useful to consider the extent to which raw materials and markets are available in developing countries by grouping them in the five categories shown in Annex A, namely:
 - (i) countries with substantial natural gas resources
 - (ii) countries with crude oil resources and a large domestic market for petrochemicals;
 - (iii) countries with crude oil resources and a small potential domestic market for petrochemicals;
 - (iv) countries with little or no crude oil resources and a large potential market for petrochemicals;
 - (v) countries with little or no crude oil resources and a small potential market for petrochemicals.

Range of petrochemical products to be covered at the consultation meeting

3. The petrochemical industry is generally defined to include the basic building blocks, intermediates and final products that are produced from crude oil, natural gas liquids and natural gas. Plastic materials, synthetic fibres and synthetic rubber are the final products produced in largest volume; industrial chemicals such as methanol, solvents, carbon black, detergents, plasticizers and dyestuffs are produced in smaller volume. Production of fertilizers is usually considered as a separate industry; industries using plastics, synthetic fibres and elastomers to make consumer goods and other final products. are also excluded from the petrochemical industry.

4. The strategy which each developing country can follow in establishing and expanding the petrochemical industry depends on each country's circumstances. The main alternatives are to start (a) by producing end-products, such as plastics and synthetic fibres, from imported intermediates, (b) by producing basic petrochemical building blocks and some intermediate products, and (c) by producing an integrated combination of basic building blocks, intermediates and final products.

5. Bearing in mind these possibilities, the Panel felt that the consultation meeting should cover petrochemical building blocks, intermediates and polymers up to and including the polymerization stage, concentrating on products supplied in large volume to the plastic processing, synthetic fibres and rubber products industries. The consultation meeting should consider the specific petrochemical projects being built or contemplated in developing countries and inter alia consider whether the olefins and aromatics produced would be marketed as such, as intermediates or as final products.

The use of petrochemical products to complement the use of natural products

6. The Panel recognized that there has been a remarkable growth in the use of synthetic petrochemical products in the last 25 years, mainly in the developed countries. Synthetic products had qualities which complement the qualities of natural products. As living standards increased there was likely to be further increase in demand for most petrochemical products.

7. The potential for increased use of synthetic petrochemical products in the developing countries in the next 25 years is very large if sufficient purchasing power can be developed. If the mass of the population in these countries is to benefit, intensive efforts to develop and promote more widespread application of synthetic petrochemical products such as plastics will be needed.

8. Developing countries should avoid producing petrochemical products that are considerably more expensive than locally available natural products. Hydrocarbons were likely to become scarcer and more expensive in the next 25 years. On the other hand, in some developing countries, there would be growing pressures to increase the area of land used for food production rather than for the production of raw material crops. Furthermore, preliminary studies showed that the production of some natural products in developed countries might use as much energy drawn from non-renewable resources as the production of competing synthetic products. There was therefore a need to view the growing consumption of petrochemical products in a broad and dynamic framework; three target dates: 1980, 1990 and the year 2000 might be considered in the UNIDO world-wide study of this industry.

9. The Panel recognized that the use of some petrochemical products is seriously affecting the use of natural products exported by developing countries; the use of polypropylene instead of jute and other hard fibres and the use of synthetic rubber were quoted as the most serious examples. Interim adjustment measures for the developing countries affected by such substitution of petrochemical products for natural products should be considered. The impact of synthetic products on the use of natural products is being considered in other international fora such as FAO and UNCTAD; it should also be considered as a possible issue for the consultation meeting.

Factors important for establishing a petrochemical industry in developing countries

10. The major factors which determine the viability of establishing petrochemical projects in developing countries were identified and discussed. Whilst recognizing that the relative importance of each factor depends on the circumstances of each individual country, the Panel considered the following five factors as the most important:

- Internal market and its development
- Export market and marketing arrangements
- Access to and cost of raw materials
- Technical skills and efficient operation of plants
- Physical infrastructure, including power, water, transport and port facilities

11. The following factors were also considered important:

- Institutional infrastructure, including Government policies, etc.
- Access to technology, problems of obsolescence, innovation and research and development
- Access to and cost of investment capital and working capital
- Secondary processing capability of integrated downstream industries
- Employment impact in the petrochemical and processing industries ^{1/}
- Pollution, hazards and safety

12. Some participants from oil-producing countries stressed their intention to develop the petrochemical industry as a means to utilize natural gas that would otherwise be flared and to increase the value of and diversity of their exports. They indicated that developed countries should make room for such exports, for example, by reducing the rate of expansion of their own production; it being understood that such countries would benefit from increased exports of petrochemical plant, technology and machinery to developing countries. Other participants indicated that plans for exports by developing countries should be considered in the context of the future growth of world consumption of petrochemical products, which was more difficult to forecast at this time because of the recent temporary interruption to growth in many markets.

13. Developing countries with both petroleum resources and capital for investment could develop their petrochemical industry by co-operating with other countries who were willing to buy their products. There was also room for specialization in production and exchange of products among countries, particularly in a range of more sophisticated end-products.

14. The Panel noted that the UNIDO world-wide study of this industry will examine the world demand and supply balance for at least major basic and intermediate petrochemical products; it recommended that UNIDO collect statistics and information at the national level to continuously up-date these estimates. In addition long-term trends in the price of

^{1/} It was pointed out that in the United States, employment in the downstream processing industries was 20 times that in the petrochemical industry itself.

some petrochemical products could perhaps be analysed. For this purpose, countries and industry associations could share information and knowledge gained from market surveys with UNIDO.

International technical co-operation in developing the petrochemical industry

15. A major concern of developing countries was to reduce the risk of their new petrochemical plants not operating efficiently and at a high rate. Most developing countries needed independent advice on the choice of technology, and UNIDO, through an international panel or other means, should be prepared to provide this. UNIDO's on-going examination of possible guarantees and insurance for the successful construction and operation of fertilizer plants ^{1/} should be extended to cover petrochemical projects; cases of incomplete transfer of know-how or defective plant and equipment and the ability of existing arbitration procedures to cope fairly with such cases should be critically examined.
16. A joint venture was a useful way for a developing country to ensure that it obtained co-operation in the field of technology transfer, manpower training and marketing of the petrochemical products produced. To help evaluate agreements for technical collaboration, it would be useful for developing countries to exchange information on the contractual terms they were offered and the effectiveness of the technology transfer achieved. UNIDO could help organize and develop this exchange of information as well as develop model contracts and joint venture agreements suitable for establishing petrochemical industries in developing countries.
17. An inadequate supply of (a) skilled workers needed to construct petrochemical plants and (b) technically trained personnel needed to operate them was proving to be an obstacle in some countries. Some developing countries were progressively developing their skills in designing and erecting petrochemical plants; these countries were in a position to assist other developing countries in these tasks by, for example, providing advice and construction teams. These same developing countries were also equipped to advise other developing countries on operating and maintenance problems and to supply some items of the equipment needed. In this connection, it would be useful if UNIDO

^{1/} As recommended by the First Consultation Meeting on the Fertilizer Industry, Vienna 17-21 January 1977. See Report of the Meeting, ID/WG.242/8/Rev.1, paragraph 64.

compiled a register of the major petrochemical production processes used in developing countries and the willingness of the parties concerned to provide advisory services.

The share of developing countries in world output of petrochemicals

18. The estimate of one participant was that in 1976 the developing countries' share of total world output of plastic materials, synthetic fibres and synthetic rubber was less than 3 per cent. The consultation meeting would examine how to increase this share.

19. The Panel agreed that developing countries as a group should aim to supply their own needs of plastics, synthetic fibres and synthetic rubber. This is the best form of target because the quantitative share of developing countries in total world output in the years ahead will depend most of all on their success in developing internal markets for these products.

20. The UNIDO world-wide study will make some quantitative estimates based on the assumption that per capita consumption of these final products in developing countries will reach a much higher level in the year 2000. A fairly accurate estimate of world demand and supply should be made for the year 1980 and the plans of individual countries should be collected so as to estimate the expansion of the industry up to 1985 and 1990. In this connection, it was noted that there would be a very large expansion of this industry in the USSR and the People's Republic of China and that these countries were likely to have a surplus available to supply other world markets. It was essential for the UNIDO world-wide study to attempt to quantify the expansion of the industry in these countries and other centrally-planned economy countries.

21. The developing countries' share of world production in the future should also take account of the potential exports to developed countries and in particular opportunities to make optimum use of gas supplies that are available in oil-producing countries. The world should aim to optimise the use of this depleting resource which is not fully used at present. The UNIDO world-wide study, therefore, should estimate for consideration at the consultation meeting what contribution olefins and other chemicals produced from this natural gas could make to the development of future world petrochemical supplies. In this connection, there was a need to examine the economics of long-

distance transportation of petrochemicals; the technical feasibility of shipping ethylene in a manner that would adequately maintain the quality of the product also needed examination.

22. The desirability of maintaining free trade in petrochemical products was recognized. The developing countries expected to obtain improved access to the markets of developed countries by, for example, setting up their own export marketing organizations.

On the other hand, whilst they were building up their own petrochemical industry, temporary high levels of costs could not be avoided in some developing countries and therefore protection on a declining scale for a number of years was needed for such infant industries.

23. The Panel recognized that many developing countries may want to establish their own petrochemical industry, to develop a knowledge of the technology, to stimulate secondary processing and other related industries, and with the objective of generating employment and saving foreign exchange. The UNIDO world-wide study will consider these benefits.

Other issues suggested for consideration at the consultation meeting

24. The main factors that needed to be considered in order that developing countries can achieve their goals in expanding production were identified above in paragraphs 10 and 11. Not all of these factors would need to be discussed at the consultation meeting. The Panel suggested that the following issues could be considered at the first consultation meeting on the petrochemical industry.

- (i) International co-operation to develop the internal market of developing countries for petrochemical products, including the approach to be adopted by developing countries with small markets in establishing industries using petrochemical products such as plastics.
- (ii) International co-operation needed to ensure access for producers in developing countries to markets in industrialized countries, including further development of the trend towards increased flexibility in the structure of the petrochemical industry in industrialized countries, and the possible need for inter-governmental agreements to provide a framework for increased purchase of petrochemicals from developing countries.

- (iii) New forms of co-operation between developing and developed countries, including buy-back agreements for both final products and intermediates, mutual investment in projects (such as Qatar in France), and the setting up by developing countries of export marketing organizations and distribution facilities in the developed countries, including terminals and transport facilities.
- (iv) The possible limits which anti-trust and cartel legislation imposes on agreements to share world markets for petrochemicals.

25. The Panel noted that international co-operation in developing the petrochemical industry had been discussed in several other international fora. It suggested that the discussion should be concentrated in one forum in the future.

26. The participants recommended that a further meeting of the Panel be held after completion of the UNIDO World-wide Study of the Petrochemical Industry in early 1978.

ILLUSTRATIVE LIST OF DEVELOPING COUNTRIES GROUPED IN FIVE CATEGORIES
BASED ON NATURAL GAS RESOURCES, CRUDE OIL RESOURCES AND THE SIZE OF
THE DOMESTIC MARKET FOR PETROCHEMICALS ^{1/}

I. COUNTRIES WITH SUBSTANTIAL NATURAL GAS RESOURCES

AFRICA: Algeria, Egypt, Libya, Nigeria
 ASIA: Bangladesh, Brunei, Indonesia, Iran, Pakistan
 MIDDLE EAST: Bahrain, Kuwait, Iraq, Oman, Qatar, Saudi-
 Arabia, United Arab Emirates
 LATIN AMERICA: Argentina, Bolivia, Colombia, Ecuador, Mexico,
 Trinidad and Tobago, Venezuela

II. COUNTRIES WITH CRUDE OIL RESOURCES AND LARGE DOMESTIC MARKET FOR
PETROCHEMICALS

AFRICA: Algeria, Egypt, Nigeria
 ASIA: India, Indonesia, Iran
 MIDDLE EAST: -
 LATIN AMERICA: Argentina, Brazil, Colombia, Mexico, Peru

III. COUNTRIES WITH CRUDE OIL RESOURCES AND SMALL POTENTIAL DOMESTIC
MARKET FOR PETROCHEMICALS

AFRICA: Gabon, Libya
 ASIA: Brunei, Malaysia
 MIDDLE EAST: Bahrain, Iraq, Kuwait, Oman, Qatar, Saudi-
 Arabia, United Arab Emirates
 LATIN AMERICA: Ecuador, Venezuela, Trinidad and Tobago

IV. COUNTRIES WITH LITTLE OR NO CRUDE OIL RESOURCES AND A LARGE
POTENTIAL DOMESTIC MARKET FOR PETROCHEMICALS

AFRICA: Ethiopia, Morocco, Sudan,
 ASIA: Bangladesh, Burma, Pakistan, Philippines,
 Republic of Korea, Thailand
 MIDDLE EAST: -
 LATIN AMERICA: -

V. COUNTRIES WITH LITTLE OR NO CRUDE OIL RESOURCES AND A SMALL
POTENTIAL DOMESTIC MARKET FOR PETROCHEMICALS

AFRICA: Ghana, Ivory Coast, Niger, Tanzania, Zambia
 ASIA: Hong Kong, Nepal, Sri Lanka, Singapore
 MIDDLE EAST: Jordan, Lebanon, Syria, Yemen Arab Republic
 LATIN AMERICA: Cuba, Guatemala, Paraguay, Uruguay

^{1/} Countries with a population that exceeded 15 million in mid-1974 are
considered to have a large potential domestic market for petrochemicals.
Populations as estimated in World Bank Atlas, 1976 Edition.

DISCUSSION PAPER

prepared by UNIDO Secretariat

for

Panel of Industrial Experts on the Petrochemical Industry

Vienna; 20 and 21 June 1977

This paper is intended to be used as a starting point for the participants' discussion at the Panel Meeting.

1. How should the petrochemical industry be defined and what range of products should be covered at the First Consultation Meeting

.....
.....

The petrochemical industry produces a range of building blocks and intermediate chemicals using petroleum or natural gas as the raw material that are used for the production of industrial chemicals, plastics, synthetic fibres and synthetic rubbers. For statistical purposes, these products and similar products manufactured from other raw materials are the major components of Groups 3511 and 3513 of the International Standard Industrial Classification. ^{1/} A copy of this classification is attached as Annex A. A list of major petrochemical products is attached as Annex B.

The panel is asked to consider:

- a) whether the five groups of final products plus the list in Annex B is a satisfactory definition of the petrochemical industry?
- b) whether the first consultation meeting should cover the whole industry, only intermediate products, or only one group of final products such as plastics?

UNIDO recognizes that whilst production considerations might suggest consideration of as broad a group as possible, the marketing of intermediates and of each group of final products, particularly in export markets, may present quite different problems.

2. What is the appropriate use of synthetic products based on petrochemicals as well as natural products in developing countries

Petrochemicals can and should make an increasingly important contribution to meeting the basic needs of the population of developing countries for food, housing and clothing. Plastics are already used on a substantial scale in irrigation, agriculture and housing; there is an enormous potential for

^{1/} Manufacture of fertilizers and pesticides is excluded as these are classified as group 3512.

expanding their use in the period up to the year 2000. Synthetic fibres offer many advantages used individually and when blended with natural fibres. Synthetic rubber is needed in combination with natural rubber to produce many rubber products.

The Panel is asked to consider:

- a) whether the growing use of synthetic products based on petrochemicals should proceed so far in developing countries that it replaces use of locally-available natural products?
 - b) what steps need to be taken to examine the potential growth in use of petrochemical products in developing countries to satisfy at least their own basic needs in the period up to 2000?
3. What is the relative importance of various factors that must be considered when establishing a petrochemical industry in developing countries

The successful establishment and operation of a petrochemical industry requires, among other factors,

1. The ability to market the range of intermediate products produced
2. The manpower skills needed to operate the plants
3. The availability and cost of raw materials
4. Physical infrastructure
5. Large capital investment
6. Avoidance of pollution

The Panel is asked to consider:

- a) how these factors influence the cost of establishing a petrochemical industry in developing countries as compared to developed countries?
 - b) which of these factors may favour the establishment of petrochemical industries in developing countries to supply export markets as well as domestic markets?
 - c) the importance of locating units producing petrochemical building blocks adjacent to refineries, to facilitate recycling for manufacturing petroleum products, and near plants producing intermediates and final products.
4. The scope for co-operation in the production of petrochemicals amongst developing countries and between developed and developing countries

Naphtha, the raw material most commonly used for petrochemical production, is the light fraction produced when crude oil is refined. Although naphtha can be imported for petrochemical production, a local supply is preferred. Natural gas is also used as a raw material; and in the future, other fractions may be used to an increasing extent.

The first stage of processing to produce olefins and aromatics is most economical when undertaken on such a large scale that the output can only be absorbed by the production of downstream products in developing countries with large markets for industrial chemicals, plastics, synthetic fibres, synthetic rubber and detergents, etc.

The Panel is therefore asked to consider:

- a) whether developing countries, who expect to sell surplus basic and/or intermediate petrochemicals to export markets, need as a prerequisite for establishing the plant joint-venture agreements, long-term sales contracts, etc?
 - b) what role can UNIDO play by assisting in the negotiation of such arrangements that will facilitate the establishment of production facilities in developing countries?
5. What should international consultations on the petrochemical industry aim to achieve

.....

Annex C provides a list of the topics which have been considered at the first consultation meetings on (a) the fertilizer industry and (b) the iron and steel industry.

The aim of consultation is to facilitate the achievement by developing countries of their industrialization goals, including a share of at least 25 per cent of world industrial output by the year 2000. The UNIDO study and other preparatory activities will therefore aim to identify both the factors constraining the development of this industry in developing countries and its potential contribution to the achievement of the 25 per cent target for industrial output as a whole.

The Panel is therefore asked to consider:

- a) what the major constraints are and how ways and means to overcome them should be examined by UNIDO?
- b) what international consultations on the petrochemical industry can realistically aim to achieve?
- c) what topics considered at consultations on other sectors need to be discussed at consultations on the petrochemical industry?
- d) what additional topics need to be considered that are particular to the petrochemical industry?

INTERNATIONAL STANDARD INDUSTRIAL CLASSIFICATION

Div. Group	Major Group
	<u>Manufacture of Paper and Paper Products; Printing and Publishing</u>
341	Manufacture of paper and paper products
3411	Manufacture of pulp, paper and paperboard The manufacture of pulp from wood, rags and other fibres; and paper, paperboard, fibre building paper and fibreboard. The manufacture of off-machine coated, glazed, gummed, and laminated paper and paperboard is classified in group 3412 (Manufacture of pulp, paper and paperboard articles n.e.c.); the production of asphalted and tar-saturated paper is classified in group 3410 (Manufacture of miscellaneous products of petroleum and coal); the manufacture of sensitized photographic paper is classified in group 3429 (Manufacture of chemical products n.e.c.); the production of abrasive paper is included in group 3469 (Manufacture of non-metallic mineral products n.e.c.); and the manufacture of carbon and steel papers is covered in group 3909 (Manufacturing industries n.s.c.).
3412	Manufacture of containers and boxes of paper and paperboard The manufacture of shipping boxes or cases made of corrugated or solid fibreboard, folding or set-up paper or paperboard boxes, vulcanized fibre boxes, sanitary food containers, bags of materials other than textile or plastics, etc., whether printed or not.
3419	Manufacture of pulp, paper and paperboard articles not elsewhere classified The manufacture of articles of pulp, paper and paperboard not elsewhere classified, such as off-machine coated, glazed, gummed and laminated paper and paperboard; pulp plates and utensils; bottle caps; unpainted cards, envelopes and stationery; wall paper; towels; toilet paper; straws; mounts; cut-outs; patterns, papier maché. The manufacture of printed cards and stationery is classified in group 3420 (Printing, publishing and allied industries).
342	3420 Printing, publishing and allied industries Printing, lithographing and publishing newspapers, periodicals, books, maps, atlases, sheet music and directories; commercial or job printing; commercial lithographing; manufacture of printed cards, envelopes and stationery; manufacture of localised devices and library binders; bookbinding; blank book making; paper ruling; and other work related to bookbinding such as book or paper bronzing, gilding and edging; map and scrap mounting; services for the printing trades such as typesetting, engraving and etching steel and copper plates; making woodcut; photo-engraving; electrotyping and stereotyping. Type foundries are classified in group 3419 (Manufacture of fabricated metal products except machinery and equipment n.e.c.). Engraving on precious metals is classified in group 3901 (Manufacture of jewellery and related articles).
	<u>Manufacture of Chemicals and of Chemical Products, Coal, Rubber and Plastic Products</u>
351	Manufacture of industrial chemicals 3511 Manufacture of basic industrial chemicals except fertilizers The manufacture of basic industrial organic and inorganic chemicals such as cyclic intermediates and crudes, dyes, organic pigments, non-cyclic organic chemicals, solvents, polyhydric alcohols, rubber processing chemicals, synthetic and natural tanning materials, gum and wood chemicals, esters of polyhydric alcohols, urea and fatty and other acids; inorganic acids, alkalis, inorganic pigments, hydrogen peroxide, carbon bisulphide, phosphorus, magnesium carbonate, bromine, iodine, industrial gas in compressed liquid and solid form; sodium nitrate, potassium nitrate and dry ice (solid carbon dioxide). The

Div. Group	Major Group
	manufacture of chemical materials for atomic fission and fusion and the products of these processes are included. The manufacture of straight, mixed, compound and complex fertilizers and insecticides and germicides, and of synthetic resins, plastic materials and synthetic fibres, and of medicinal chemicals, are classified in group 3512, 3513 and 3522, respectively. Sulphuric, phosphoric and nitric acid plants which are operated in conjunction with fertilizer plants and can be separately reported are to be classified in this group.
3512	Manufacture of fertilizers and pesticides The manufacture of straight, mixed, compound and complex nitrogenous, phosphate and potash fertilizers; the formulation and preparation of ready-to-use pesticides, insecticides fungicides and herbicides and of concentrates for this purpose. Included are sulphuric, phosphoric and nitric acid plants operated in conjunction with fertilizer plants which can not be separately reported; establishments primarily engaged in manufacturing urea are classified in group 3511. The manufacturing of basic or technical chemicals used in preparing pesticides, such as lead and calcium arsenates, copper sulfates, DDT, BHC, is classified in group 3511.
3513	Manufacture of synthetic resins, plastic materials and man-made fibres except glass The manufacture of synthetic resins, plastics materials and non-vulcanizable elastomers, in the form of moulding and extrusion compound, solid and liquid resins, sheets, rods, tubes, granules and powders; cellulose and other man-made fibres, except glass, in the form of monofilament, multi-filament, staple or tow suitable for further processing on textile machines; and vulcanizable elastomers (synthetic rubber). Not included are the further processing of purchased resin or plastic materials to produce plastics products, film and sheets, which is classified in group 3560 (Manufacture of plastic products n.e.c.); and the throwing, twisting, spinning and weaving of purchased man-made fibres, which is classified in group 3211 (Spinning, weaving and finishing textiles).
352	Manufacture of other chemical products
3521	Manufacture of paints, varnishes and lacquers The manufacture of paints, varnishes, stains and shellac; lacquers; anacris and jaspers. Also included is the manufacture of allied products such as composite thinners, paint removers, paint brush cleaners, putty and other salting and filling materials. The production of white spirits is classified in group 3530 (Petroleum refineries).
3522	Manufacture of drugs and medicines The manufacture, fabrication and processing of drugs and medicines, including biological products, such as bacterial and virus vaccines, serums and plasmas; medicinal chemicals and botanical products, such as antibiotics, quinine, strychnine sulphate, opium and derivatives, adrenal, caffeine, codeine deriv... vitamins and pharmaceutical preparations for human or veterinary use.
3523	Manufacture of soap and cleaning preparations, perfumes, cosmetics and other toilet preparations The manufacture of soap in sav form, synthetic detergents, shampoos and shaving products; cleansers, washing and scouring powders and similar cleaning preparations; crude and refined glycerin from vegetable and animal oils and fats; natural and synthetic perfumes, cosmetics, lotions, hair dressings, toothpaste and other toilet preparations. The manufacture of synthetic glycerin and synthetic perfume essence is classified in group 3511 (Manufacture of basic industrial chemicals except fertilizer); and the production of essential oils is classified in group 3520 (Manufacture of chemical products n.e.c.).

LIST OF MAJOR PETROCHEMICAL PRODUCTS

BASIC PETROCHEMICAL BUILDING BLOCKS

Olefins (ethylene, propylene, butadiene etc.)
 Aromatics (benzene, toluene, xylenes etc.)
 Others (Alpha-paraffins etc.)

DOWNSTREAM PETROCHEMICAL PRODUCTS*

<u>Building blocks</u>	<u>Intermediates</u>	<u>Final Products</u>
Ethylene	- [Ethylene oxide (IOC) → Ethylene glycol (IOC) + DMT Vinyl chloride (IOC) Vinyl acetate	Polyethylene (P) Polyester (F,P) PVC (P) PVA (P)
Propylene	- Propylene glycol (IOC) Phenol. (IOC) Acrylonitrile (IOC)	Polypropylene (P) Acetone (S) Diacetone (S) Butanol (S) Octanol (S) MIBK (S) Acrylic fibre (SF) Methyl Methacrylate (P) ABS (P)
Ethylene } Benzene }	Styrene (IOC)	Polystyrene (P)
Ethylene Benzene	Styrene } Ammonia } Caprolactam	Polyamides (SF)
Butadiene Butadiene + Benzene	- Styrene	Polybutadiene (SR) SBR (SR)
Benzene	Nitro-benzenes, chlorobenzenes etc. (IOC) DDB	Aniline (DRM) Acetanilide (Ph.RM) Detergents
Toluene	ONT, FMT, MNT, DMT (IOCs)	
Xylenes	DMT or PTA + ethyleneglycol Phthalic anhydride (Pl) IOP (Pl)	Polyester (SF,P) } solvents
Alpha-paraffins	Detergent alkylate	Detergents

* IOC Intermediate organic chemical
 Pl Plasticiser
 S Solvent
 P Plastic
 SF Synthetic fibre
 SR Synthetic rubber
 DRM Dyes raw material
 Ph.RM Pharmaceutical raw material

TOPICS AND ISSUES CONSIDERED AT CONSULTATION MEETINGS ON OTHER INDUSTRIAL SECTORS

<p>Consultation Meeting on the Fertilizer Industry</p>	<p>Consultation Meeting on the Iron and Steel Industry</p>
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1. OBJECTIVES FOR THE GROWTH OF OUTPUT IN DEVELOPING COUNTRIES UP TO 2000

- | | | |
|---|--|---|
| <p>(a) Broad objectives</p> | <p>Self-sufficiency for developing countries
Growing exports to developed countries
Balance in world demand/supply</p> | <p>Iron and steel projects in developing countries to be encouraged and supported</p> |
| <p>(b) Physical targets</p> | <p>UNIDO to organize continuous monitoring of growth of world fertilizer production capacity</p> | <p>World demand likely to grow from 700 million tons up to 1750 million tons</p> |
| <p>(c) Developing countries' share of world output in the year 2000</p> | <p>Share of at least 40 per cent implied by UNIDO forecasts</p> | <p>Share might be as much as 30 per cent</p> |

2. INFRASTRUCTURE REQUIRED TO ESTABLISH PLANTS

- | | | |
|--|---|----------------------|
| <p>(a) Physical infrastructure for the plant</p> | <p>Constraint - UNIDO is to examine specific requirements</p> | <p>Not discussed</p> |
| <p>(b) Infrastructure for distribution</p> | <p>Lack of such infrastructure a serious constraint in many countries - UNIDO/FAO is to examine further</p> | <p>Not discussed</p> |

3. RAW MATERIALS

- | | | |
|------------------------------------|--|--|
| <p>(a) Availability and access</p> | <p>Not a constraint</p> | <p>World shortage of coking coal. UNIDO to make review of world reserves</p> |
| <p>(b) Price</p> | <p>Raw materials available in some developing countries at favourable prices</p> | <p>Present price of iron ore too low to encourage investment needed to expand world supplies in medium term. UNIDO to assess world resources and investment costs.</p> |

Consultation Meeting on the Fertilizer Industry

Consultation Meeting on the Iron and Steel Industry

4. CONSTRUCTION OF PLANTS

- (a) Contracts for erection and operation of plants
- (b) Consequential losses arising from defective design/equipment
- (c) Cost of constructing plants in developing countries
- (d) Use of indigenous resources and locally-produced equipment

UNIDO to examine contract procedures

UNIDO to examine feasibility of multilateral insurance scheme

Costs have increased sharply. UNIDO is to examine possible ways to reduce costs

Greater reliance on indigenous skills in design and construction recommended

UNIDO to examine contract procedures and guarantees

See above

Not discussed

Capital goods for the steel industry should be considered at a consultation meeting on capital goods

5. OPERATION OF PLANTS

- (a) Manpower training
- (b) Improving operations of existing plants

Training facilities should be created and developed by developing countries with external assistance

Where needed, studies should be made and consultancy services offered. Financing institutions to favour investment required

UNIDO to convene groups of experts to consider specific solutions to the training problems faced by developing countries

Not discussed

6. FINANCING OF PLANTS

- (a) Volume required to build plants up to 2000
- (b) Criteria for financing projects in developing countries
- (c) Terms and conditions of financing
- (d) Guarantees for external contributions to financing

Possible constraint. Use new sources of finance. UNIDO to further examine topic

Well conceived feasibility studies needed. Projects should be viable

Favourable terms needed to minimize cost of fertilizers

Discussed under contract procedures (Item 3(a) above)

Likely to be a major constraint. Use international capital markets and new sources. UNIDO to examine further

Low return from existing investment in steel projects was noted

UNIDO to examine suitability of terms offered at present

UNIDO to examine nature and content of guarantees required

Consultation Meeting on the Fertilizer Industry

Consultation Meeting on the Iron and Steel Industry

7. TECHNOLOGY

(a) New technologies

(b) Institutions in developing countries

(c) UNIDO industrial technical information bank

(d) Consultancy services

UNIDO to survey the alternative techniques including sponge iron that might replace coking coal by other fuels and reductants

UNIDO to continue to assist developing countries in establishing national metallurgical centres and laboratories

UNIDO to examine need for an international technical and development centre to guide developing countries in establishing steel plants and to provide consultancy services

UNIDO to establish information service on new and existing processes, plant and equipment, project and equipment costs

UNIDO to establish panel of experts to provide a broad range of consultancy services covering preparation of feasibility studies, negotiation of contracts, etc.

8. COOPERATION AMONG DEVELOPING COUNTRIES AND INTERNATIONAL SUPPORT

(a) Regional co-operative programmes

Regional groups to give priority at the regional level to feasibility studies, setting up plants and establishing a regional distribution network

UNIDO to promote consideration at the regional level of plans for expanding the iron and steel industry

Consultation Meeting on the Fertilizer Industry

(b) Institutional arrangements among developing countries

UNIDO to consider assisting establishment of regional development centres for the fertilizer industry

(c) External assistance to regional groups

Technical and financial assistance to be made available for such regional group efforts from bilateral and international sources

UNIDO to assist regional co-operative efforts and provide consultancy services on request

Consultation Meeting on the Iron and Steel Industry

UNIDO to promote exchange of information between iron and steel research and development institutes in developing and developed countries

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I - 103



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