OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.

DISCLAIMER

FAIR USE POLICY

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

20177

Distr.
LIMITED

IPCT.180(SPEC.)
8 April 1993

UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

ORIGINAL: ENGLISH

Global Preparatory Meeting for the
Consultation on Downstream Petrochemical
Industries in the Developing Countries

Vadodara, India, 23-25 February 1993

REPORT

V.93-84205 9109T

CONTENTS

PREFACE

1. The Lima Declaration and Plan of Action on Industrial Development and Cooperation adopted by the Second General Conference of the United Nations Industrial Development Organization (UNIDO), held at Lima, Peru, in March 1975, and subsequently endorsed by the General Assembly, recommended that UNIDO should include among its activities a system of continuing consultations between developed and developing countries with the object of raising the developing countries' share in world industrial output through increased international cooperation. 1/

2. In May 1980, the Industrial Development Board of UNIDO decided to put the System of Consultations on a permanent basis, and in May 1982, it adopted its rules of procedure 2/ setting out its principles, objectives and characteristics, notably:

- The System of Consultations should be an instrument through which UNIDO would serve as a forum for developed and developing countries in their contacts and consultations directed towards the industrialization of developing countries; 3/

- Consultations would also permit negotiations among interested parties at their request, at the same time as or after consultations; 4/

- Participants of each member country should include officials of Governments as well as representatives of industry, labour, consumer groups and others, as deemed appropriate by each Government; 5/

- Final reports of the Consultation should include such conclusions and recommendations as were agreed upon by consensus by the participants; the reports should also include other significant views expressed during the discussions. 6/

3. Since 1975, 46 Consultation meetings have been convened on agricultural machinery, building materials, capital goods, electronics, fertilizers, fisheries, food-processing, industrial financing, iron and steel, leather and leather products, non-ferrous metals, petrochemicals, pharmaceuticals, small- and medium-scale enterprises, the training of industrial manpower, vegetable

---

1/ Report of the Second General Conference of the United Nations Industrial Development Organization (ID/CONF.3/31), chap. IV, "The Lima Declaration and Plan of Action on Industrial Development and Cooperation", para. 66.

2/ See Draft rules of procedure for the System of Consultations (ID/B/258), annex.

3/ Official Records of the General Assembly, Thirty-fifth Session, Supplement No. 16 (A/35/16), vol. II, para. 151(a).

4/ Ibid., para. 151(b).

5/ Ibid., para. 152.

6/ Ibid., Thirty-second Session, Supplement No. 16 (A/32/16), para. 163.

oil and fats, and wood and wood products. Four Consultation meetings on the petrochemical industry have been held at Mexico City (1979), Instanbul (1981), Vienna (1985) and Innsbruck (1992).

4. The Consultation process, by virtue of its consensual and normative character, has revealed itself to be an efficient vehicle for fostering cooperation. It is eminently suited to assist member States in the formulation of strategies and policies for industrial development.

5. The System of Consultations operates under the continuous and close guidance of the Industrial Development Board. In addition to undergoing annual reviews and periodic appraisals, the System was subjected to an in-depth evaluation in 1989, which concluded that it was making a major contribution to the development and formulation of UNIDO policies and programmes in specific sectors through integration and interaction with the other main activities.

INTRODUCTION

6. The Global Preparatory Meeting for the Consultation on Downstream Petrochemical Industries in the Developing Countries was held at Vadodara, India, from 23 to 25 February 1993. It was attended by 24 participants from 11 countries and official representatives of the Government of India (see annex).

Background

7. In today's world, downstream petrochemical products such as plastics, fibres, synthetic rubbers and copolymers. have surpassed traditional materials such as metal, wood, glass, natural fibre, rubber and paper not only in economy, but also in performance. Processed products from downstream petrochemicals are continuously replacing traditional materials on the basis of their enhanced efficiency while finding new uses in areas of basic human needs such as agriculture, food, clothing, shelter, water management and health care, and while contributing innovatively to the automobile and electronics industries, space technology etc.

8. For example, water treatment and irrigation systems have become much cheaper and more efficient with the use of polyvinyl chloride (PVC) pipes and plastic components. Dramatic advances in personal computers or home entertainment devices such as video cassette recorders would not have been possible had manufacturers had to rely on metal, wood or glass as their primary materials. With the extensive use of innovative plastics, automobiles and trucks are much more fuel-efficient, and life-saving medical procedures such as angioplasty are now routinely available. Several foods, drinks and consumer products simply could not be marketed without plastic packaging.

9. Much of the improvement in the standard of living in developed regions is associated with the availability of downstream petrochemical products. The petrochemical industry evolved in three developed regions; namely, North America, Western Europe and Japan, all of which experienced a rapid increase in the consumption of downstream products of the industry. The excess products from these regions were exported to developing countries.

10. The oil price increases of the early 1970s forced the industry to undertake massive restructuring and consolidation. Capacities for basic petrochemicals were built in proximity to the raw materials and the markets or both. Thus, new plants were built in Latin America, the Middle East and South-East Asia that resulted in overcapacity. This, in turn, led to low capacity utilization and lower margins, which undoubtedly had, and will continue to have, a negative effect on the entire industry.

11. By 1995, the world's ethylene capacity is projected to be 86 million tonnes/year against a demand of 72 million tonnes/year, resulting in a capacity utilization of 83.7 per cent. Some regional imbalances are even greater. In 1990, ethylene production in Western Europe was 14.7 million tonnes against a capacity of about 17.5 million tonnes. By 1996, it is projected to increase to 20 million tonnes/year against a projected demand of 15 million tonnes/year.

12. In South-East Asia, ethylene capacity is expected to reach 23 million tonnes/year against a demand of 21.45 million tonnes/year by the year 2000. By that time, the Middle East's ethylene capacity will be 6.31 million

tonnes/year amounting to 6.5 per cent of the global capacity. Thus South-East Asia, a traditional market for Japanese and Middle East producers, will become a surplus region, prompting Middle East producers to try to sell their surplus products to the European market.

13. Although the demand for downstream petrochemical products has plateaued somewhat in the developed regions, satisfying the basic needs of the growing population in developing countries without severely depleting precious natural resources could create a significant demand-led growth for these industries in the developing regions, as shown by the currently low per capita consumption.

14. One of the important characteristics of the pattern of demand for downstream petrochemical products is that where there is low per capita consumption, demand has been observed to triple or quadruple as soon as products are manufactured locally. For example, the consumption of plastic resins in Saudi Arabia has reached 300,000 tonnes/year, a twentyfold increase over the 15,000 tonnes/year consumption of a decade ago when the country started to produce its own plastics. More than 200 firms are now involved in processing plastics in Saudi Arabia.

15. Likewise, recent political and economic changes in the former Soviet Union and Eastern European countries have opened new avenues for demand-led growth for downstream petrochemical products. In the new countries that made up the former Soviet Union, there is only 1 million tonnes/year of installed polyethylene capacity. It has been predicted that over the next five years, there will be a significant increase in the consumption of plastics in that area and elsewhere in Eastern Europe, and that this demand will have to be met by imports.

16. Given the global overcapacity for basic petrochemicals, the downstream petrochemical industry could tap the huge potential for demand-led growth for its products thus easing the strain that the global petrochemical industry is experiencing.

Objectives

17. The main objectives of the Global Preparatory Meeting were:

(a) To review the current status of, and future prospects for, the downstream petrochemical industries, particularly in the subsectors dealing with plastics, synthetic fibres and synthetic rubbers;

(b) To identify priority issues for the consideration of the Consultation on Downstream Petrochemical Industries in the Developing Countries to be held at Tehran, Islamic Republic of Iran, in November 1993.

AGREED CONCLUSIONS AND RECOMMENDATIONS

18. The Global Preparatory Meeting, after in-depth discussions of the topics raised in the Secretariat's background document entitled "The current status of and future prospects for the downstream petrochemical industries in the developing countries" (ID/WG.533/1) identified the following issues for the consideration of the Consultation on Downstream Petrochemical Industries:

(a) Manufacturing and application technologies for downstream petrochemical industries;

(b) Marketing of, and market development for, petrochemicals.

19. The following conclusions and recommendations were reached:

Manufacturing and application technologies for downstream petrochemical industries

(1) Imported process technologies can only be meaningfully absorbed by the recipient developing country through the strengthening of indigenous technological capabilities. In that context, the crucial importance of human resource development is emphasized. Technology transfer contracts should be so negotiated that adequate provisions for local training will enable a proper assimilation of the technology, which, in return, is a prerequisite for the efficient operation of petrochemical plants.

(2) The Global Preparatory Meeting agrees that the petrochemical industry is continuously shaped by technological innovations. Therefore, investment decisions in the sector are to be made in full awareness of all the available technological options. However, the accessibility by the developing countries to some technologies and process know-how in the petrochemical industry is hampered by a number of constraints. The Meeting recommends that, in such cases, innovative enterprise-to-enterprise cooperation and joint-venture schemes should be explored to motivate the technology holders through vested interests.

(3) In order for research and development centres to function effectively, they should cater to the specific needs and requirements of industry and other end-users of petrochemical products. Thus, they could not only provide the impetus for the adoption of imported technology, but also evelop indigenous technological options suited to the local socio-economic conditions and industrial realities of those countries. Research and development efforts deployed in the petrochemical industries of developing countries could be more gainfully directed towards downstream processes and technology rather than basic petrochemistry. In that context, adequate consideration should be given to the exigencies of environmental protection, safety and public health.

(4) In order to keep abreast of the rapid technological changes and emerging processes in the field, the compilation of a corresponding directory might render a useful service. Existing producer associations, international agencies, research and development centres etc. should be called upon for their assistance in that important undertaking.

(5) The role of adequate infrastructure, both human and physical, and well-functioning support institutions is emphasized for the development of indigenous resources, adaptation of new technologies to local

conditions, development of new processes and technologies, and improvement of products and grades of polymers with new and innovative applications.

(6) Finally, closer interaction and feedback between industry, consumers, research and development centres, vocational training, academia and industrial policy makers should be encouraged in order to attain the objective of improved indigenous technological capabilities in the developing countries.

Marketing of, and market development for, petrochemicals

(7) In line with the documentation submitted to the Global Preparatory Meeting, the participants agree that downstream processing industries should be established wherever viable to provide industrial input to various sectors of economic activity, particularly shelter, agriculture, health care and clothing, which offer a large potential for the absorption of downstream petrochemical products.

(8) The establishment or strengthening of product application and development centres is judged by the Global Preparatory Meeting to be an indispensable phase in the overall growth of downstream petrochemical industries in the developing countries. Such efforts should aim particularly at identifying innovative applications and new uses for the products of those industries.

(9) These efforts should form an integrated part of an effective marketing strategy based on realistic assessments of identified consumer needs and market requirements with respect to products, prices, specifications and availability. In this context, the crucial role of product promotion and assistance in end-use is emphasized.

(10) The adoption of effective marketing policies necessitates the availability of and access to reliable information on market-related parameters. Regional and international agencies could provide some assistance to supplement national efforts in data collection and evaluation. In that context, the existing regional information networks could render valuable services.

(11) The availability and accessibility of reliable market-related information is not only required for the formulation of marketing strategies, but also constitutes an essential element in the identification of investment opportunities in the sector. Therefore, the transparency of supply-demand balances based on a realistic assessment of market potential plays a key role in the further development of the downstream petrochemical industries.

(12) All market development strategies must encompass, as an integral component, an enhanced awareness of quality control and its management in order to ensure sustained customer satisfaction. That consideration gains added importance when domestic manufacture is aimed at the import substitution of petrochemical products.

(13) Finally, the Meeting concludes that, in developing countries, marketing in general and market development efforts for the products of downstream petrochemical industries in particular have not kept pace with the activities employed elsewhere in the sector such as plant erection and operation. Therefore, there exists a tremendous potential for increasing marketing and market development efforts at the corporate and industrial policy levels.

I. ORGANIZATION OF THE GLOBAL PREPARATORY MEETING

Opening of the Global Preparatory Meeting

Statement by the Secretary, Directorate General of Technical Development of the Government of India

20. Speaking on behalf of the Government of India, the Secretary of the Directorate General of Technical Development welcomed the participants to Vadodara. He stressed the need for far-ranging discussions on global issues pertaining to downstream petrochemical industries in the light of a growing polarization of the economic scene within a seemingly unipolar world in terms of politics.

21. The Secretary described the importance of downstream petrochemical industries to the country as they endeavoured to prevent further disruption of the ecological balance by meeting the requirements of its enormous population for food, clothing and shelter. He recognized that petrochemicals offered effective alternatives in critical areas, such as water management, packaging, conservation of foodstuffs, utilization of productive land, cost-effective clothing and shelter, and a variety of industrial inputs to increase national productivity and to create employment opportunities.

22. He referred to the Government's recent efforts to liberalize industry and trade in order to support that process of development by removing trade barriers, easing licensing procedures, making the rupee partially convertible and improving competitive advantage by encouraging domestic firms to compete globally.

23. To sustain such efforts, the Secretary said that it was necessary to practise a form of creative destruction of old advantages in order to create new ones, with a view to establishing a global approach based on the exploitation and expansion of home-based techno-economic capabilities. Nevertheless, recognizing the economic handicaps of developing countries, he urged the exploration of all possibilities through international collaboration and strategic alliances in order to meet global competition.

Statement on behalf of the Acting Director-General of UNIDO

24. A representative of UNIDO expressed his appreciation for the co-sponsorship offered by the host authorities through the services of the Indian Petrochemicals Corporation. In presenting the System of Consultations as a forum for discussions to find realistic answers to the problems of global industrialization, he stated that UNIDO assistance had been important to the development of the petrochemical industries of developing countries.

25. Regarding the role of industry in economic welfare and human well-being, he examined the various advantages of petrochemical products in ushering in advanced technical procedures and in excelling traditional materials in terms of performance and economy. Such contributions were particularly applicable in the areas of transportation, electronics, irrigation, computers, home entertainment, packaging, medical equipment, food and beverages and other consumer products. He therefore suggested that participants should address the problems hindering the growth of downstream petrochemical industries in the light of integrated marketing and market development, environmental protection, information-gathering, technological research and development, and engineering and construction capabilities.

Statement by the Chairman of the Global Preparatory Meeting

26. The Chairman of the Global Preparatory Meeting, the Director of Personnel and the Director-in-Charge of Projects of the Indian Petrochemicals Corporation Ltd., expressed his confidence that petrochemical industries were the major contributors to enhancing the quality of life and the key drivers of the economic growth of the world in general and of Asia in particular.

27. The Chairman attributed particular circumstances that had globally contributed to the growth and development of downstream petrochemical industries to:

- The ready availability of feedstocks
- The availability of low-cost alternative feed
- Domestic or international market demand
- The scale and flexibility of operations
- The development of leading technologies

28. He cited several examples where one or more of those factors had helped in developing the industries concerned. Japan, for instance, had embarked on a large scheme of capacity reduction for greater efficiency and wider profit margins. Simultaneous with the Asian market's harnessing of the advantages of captive production leading to a doubling of its ethylene capacity, Japan's ethylene capacity had been greatly reduced in percentage terms, at least over the previous 10 years, owing to increasing regional restructuring in downstream petrochemicals in Asia. The development of capacities aimed at domestic or regional markets was increasingly judged to be more reliable than the installation of capacities aimed at export markets. In addition, exporting at below marginal cost levels might not be a viable option forcing units to adopt a two-tier approach to the price structure of feed in order to promote export and domestic profitability at the same time. The United States and Europe had led the growth process on account of the development and the availability of the technologies needed for the purpose. Finally, continuously reduced margins were forcing manufacturers to establish plants of increasingly higher capacity levels.

29. He expressed his belief that developing energy-efficient and environmentally friendly technologies both for upstream and downstream petrochemical production was the key to success and to assuring the continuous profitable existence of the industry in view of depleting natural resources.

30. Regarding the Indian experience, the Chairman reviewed the significant strides made by the country in acquiring, assimilating and developing process technologies to facilitate production and consumption of various petrochemical products. Giving plastics as an example, he stressed that India possessed the capabilities and the human resources in developing applications in areas such as potable water transportation, communications, construction materials, fertilizers, packaging and rural electrification aimed at preserving the ecological balance, generating employment and increasing productivity.

31. He requested the participants to explore all possible strategies in planning upstream and downstream petrochemical developments and to consider particularly issues pertaining to investment, overcapacity, plant construction, feedstock and coproducts, product life cycle, environmental protection, joint ventures and responsible resource management.

Presentation of UNIDO operational activities

32. A representative of the UNIDO secretariat said that, through its technical assistance programme, UNIDO had been involved for a long time in the downstream petrochemical industries. Its participation in setting up research and development centres, which were the basis for any development of the industry, stretched back to centres in Argentina (Programa de investigación y desarrollo del complejo petroquímico de Bahía Blanca), Egypt (Egyptian Petroleum Research Institute), India (Central Institute of Plastics Engineering and Technology), Pakistan (Petroleum Refining and Petrochemical Corp. Pvt. Ltd.) and Turkey (Petrokinya Holding A.S.).

33. He said that surveys had been undertaken in the Maghreb region in Algeria, the Libyan Arab Jamahiriya and Tunisia for the plastics industry. Other missions had been undertaken on an ad hoc basis concerning fertilizer and polyethylene plants in Algeria in order to carry out debottlenecking, to improve operations or to solve pollution problems. In the Libyan Arab Jamahiriya, a PVC plant was being given continuous support in order to improve operations and maintenance. In addition, a training centre for safety and security had been set up for the petroleum industry.

34. In the Persian Gulf area, assistance in industrial pollution and environmental regulation had been provided to Kuwait and the United Arab Emirates. In Saudi Arabia, a mission had been fielded to report to the Ministry of Planning on the high-capacity utilization of linear low-density polyethylene (LLDP), high-density polyethylene (HDPE), ethylene and styrene in the petrochemical plants of the Saudi Arabian Basic Industries Corporation.

35. At the request of the Gulf Cooperation Council (GCC), whose membership comprised Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirates, a more comprehensive techno-economic study was being undertaken on the identification of technically viable and economically profitable medium-scale and large downstream petrochemical plants and projects that would lead to further detailed investigations. The proposed list of products included: acrylonitrile, propylene glycol, epoxy resins, ethoxilated oils, lubricating oil additives, vinyl acetate and polyisobutylene rubber.

36. The region of GCC was well endowed with raw materials and some intermediates for a profitable development of the petrochemical industry. The existing basic feedstocks such as propane, butane, naphtha and gas oil might provide a wide range of investment opportunities not only for the manufacture of intermediate products but also for the manufacture of finished products, which required modest investments and less specialized know-how as the transfer of technology was part of the arrangements for machinery and equipment.

37. In Asia, technical assistance had been provided for the design and construction of a petroleum refinery in Viet Nam.

38. In Latin America, the rehabilitation of existing plants in Cuba and Ecuador had helped to minimize energy use and to improve yields.

39. In many countries, projects were being implemented for the formulation of lubricating oil and the production and recycling of lubricating oil additives.

Election of officers

40. The following officers were elected:

Chairman: S. K. Mukherjee (India), Director (Personnel) and Director-in-Charge (Projects), Indian Petrochemicals Corporation Ltd., Vadodara

Rapporteur: S. Dutta (India), Principal, Petrochemicals Management Development Institute, Indian Petrochemicals Corporation Ltd., Vadodara

Chairmen of sessions: W. M. Butt (Pakistan), Managing Director, Technology Management International Limited, Lahore

Ahmed Moustafa Dessouki (Egypt), Petrochemical Adviser, The Egyptian General Petroleum Corporation, Cairo

Ruben H. Maltese (Argentina), Asociación Petroquímica Latinoamérica, Buenos Aires

Ali Monzavi (Islamic Republic of Iran), Managing Director, Behran Oil Company, Tehran

Officer-in-Charge, System of Consultations, United Nations Industrial Development Organization

Chief, Process Industries Sector, System of Consultations, United Nations Industrial Development Organization

Adoption of the agenda

41. The following agenda was adopted:

1. Opening of the Global Preparatory Meeting.

2. Election of the Chairman, Rapporteur and Chairmen of the sessions.

3. Adoption of the agenda and organization of work.

4. Current status of and prospects for the downstream petrochemical industries in developing countries.

5. Review of UNIDO operational activities in the field of petrochemicals.

6. Discussion of the themes:

   - Prospects for and constraints on the growth of downstream petro-petrochemical industries in developing countries especially plastics, synthetic fibres and synthetic rubbers;

   - Integration of downstream petrochemical industries into other sectors of the national economy with emphasis on marketing, and product and market development;

   - Environmental protection and safety in the development of downstream petrochemical industries;

- Enhancement of the technological base of developing countries in order to promote the growth of downstream petrochemical industries with special reference to assessing information related to engineering and construction capabilities and using locally available resources.

7. Identification of the priority issues to be submitted to the Consultation on Downstream Petrochemical Industries in the Developing Countries, Tehran, November 1993.

8. Adoption of the recommendations and closing of the meeting.

9. Technical plant visits to downstream petrochemical installations of Indian Petrochemicals Corporation Ltd. in the vicinity of Vadodara.

Adoption of the report

42. The report of the Global Preparatory Meeting for the Consultation on Downstream Petrochemical Industries in the Developing Countries was adopted at the final working session on 24 February 1993.

II. SUMMARY OF DISCUSSIONS

Presentation of the theme of the Global Preparatory Meeting

43. A representative of UNIDO amplified the theme of the Global Preparatory Meeting. He said that bulk petrochemical products were converted into consumer items by downstream petrochemical processing industries. The borderline between the upstream and downstream portions of the industry was far from well-defined. In plastics, the production of polymers in powder form was considered an upstream petrochemical process, just as blending and granulation, including operations performed within the plant, were also upstream operations. However, the processing of the powders, master blends and granulates by injection moulding, extrusion and calendering into semi-finished and end-products was regarded as a downstream operation.

44. In man-made fibres, the production of polymer or polycondensate chips was an upstream petrochemical activity. Filament and yarn spinning, dyeing and texturing were considered either, whereas further processing of the resulting products was a textile industry operation. Synthetic rubber production was both an upstream petrochemical activity and a rubber processing activity. Detergent production was deemed a downstream activity. Varnishes and paints were considered either or both.

45. The manufacture of additives and plasticizers as well as of engineering items, such as moulds and dyes for conversion processes, was also considered to be part of the downstream processing industry. In developed countries, those critical sectors worked closely so that the plastics industry could be thought of as a network of interdependent skills and technologies that allowed efficiency of operation and ensured the quality of products offered to the consumer.

46. In the developed countries, the downstream petrochemical industry had followed a path that was characteristic of the economic, social and technological conditions in those countries. Developing countries were unlikely to follow a similar path. Particular attention should be paid to planning the end-uses of petrochemical products so that they were appropriate to the prevailing economic, social and industrial conditions.

47. Such end-uses, as well as the efforts to promote them (market development) should aim at satisfying the basic needs of the population and at improving its standard of living in terms of food production and storage, water distribution and management, and housing and clothing requirements.

48. The discussions of the Global Preparatory meeting are summarized below.

49. The participants agreed that the continued development of the downstream petrochemical industries was vital for the developing countries as they:

(a) Created additional employment opportunities;

(b) Contributed to a better quality of life for the majority of people by improved methods of water treatment and irrigation, leading to higher agricultural production;

(c) Found application in life-saving drugs and in advanced medical procedures;

(d) Led to improved techniques for the commercial marketing of food products, consumer products etc.;

(e) Provided potential sources for supplementing and substituting scarce natural resources and thus helped to maintain an ecological balance.

50. Keeping in view the significant changes that were emerging in the economic and related fields throughout the world, the participants suggested that common issues should be considered not from the sectoral angle but from a global viewpoint. The possibility of developed countries extending a hand to the developing countries, through the good offices of UNIDO, in the areas of technology, financial support, industrialization etc. was to be considered.

51. The participants acknowledged that the all-round development in many areas of human existence had made a perceptible dent in the environment. It was therefore proposed that the further development of the downstream petrochemical industries would require a shift towards the use of inherently clean and environmentally friendly products and processes by adopting low-waste generating technologies, through conscious efforts, supported by appropriate legislation.

52. On the sensitive issue of overcapacity in the downstream petrochemical industries, the participants agreed to call for a detailed consideration, as an isolated examination of an existing situation of overcapacity in a particular country would indicate a distorted picture. It was thus judged that a temporary phenomenon of overcapacity in a developing country would not be a serious issue by itself as there would be considerable scope for increased demand and consumption.

53. It was conceded that there was a need for close interaction between the developing countries for drawing upon the expertise available in the integrated management of petrochemical projects covering such aspects as engineering capabilities, manufacture of critical equipment and allocation of resources for construction, fabrication, and the erection and operation of plants.

54. The participants recommended that detailed discussions should be called for regarding the future availability of feedstocks, and the impact of the product life cycle on petrochemical industries as a whole as both aspects had a direct bearing on future plans for, and the growth of, downstream petrochemical industries.

55. A representative of UNIDO suggested that the technology should be considered in a wider sense, and seen in connection with other aspects such as the provision of research and development assistance etc. One of the main constraints on developing countries was obtaining the right type of technology at a reasonable cost.

56. He said that he was convinced that marketing in general and market development in particular needed greater attention as those topics had become quite complex in current times. It was not enough for a product to be produced and sold; market intelligence and market information needed to be sharpened and product development should be entirely customer-oriented. There was a need to be one step ahead of customers' changing requirements.

57. Finally, he assured the participants that the concept of management in an industry had assumed greater importance in view of the greater impact of market

forces on account of the recent liberalization measures taken by many countries. Human resource development was turning out to be an all-embracing activity. Management did not confine itself to technology and hence the question of management methods called for detailed consideration.

58. The wish was expressed that a background paper on the Global Environment Facility, which became operational in May 1991 and which was managed jointly by the United Nations Development Programme, the United Nations Environment Programme and the World Bank, might be prepared for submission to the Consultation in November 1993 indicating the features of the Facility and its *modus operandi* etc.

59. One participant suggested that it would be useful to have a data bank providing information on the state-of-the-art petrochemicals technology available in the developing countries, with particular reference to downstream units. Such data should be supplemented with information on the availability of different types of skill, resources and expertise.

60. Another point raised concerned the disposal of plastic waste and the feasibility of recycling used plastics, subject to economic viability and impact on the environment etc. The participants were reminded that UNIDO was currently investigating the whole gamut of environmental protection and pollution control issues associated with downstream petrochemical industries, including the disposal of plastics. A report would be submitted to the Consultation in November 1993.

Annex

LIST OF PARTICIPANTS

Algeria

Abdessami Djellali, Technical Director, Enterprise nationale des industries pétrochimiques (ENIP), B.P. 215, Skikda

Argentina

Ruben H. Maltese, Asociación Petroquimica Latinoamerica (APLA), Esmeralda 352, 3° Piso, of.B, 1036 Buenos Aires

Belgium

A. G. Reed, Secretary-General, Association of Petrochemicals Producers in Europe (APPE), Avenue E. Van Nieuwenhuyse 4, Box 1, B-1160 Brussels

China

Yu Kang Zhuang, Vice-Chief Engineer, Nanjing Chemical Industrial Group, Building 4, No. 8, Xinhua Block, Dachangzhen, Nanjing

Egypt

Ahmed Moustafa Dessouki, Petrochemical Adviser, Egyptian General Petroleum Corporation (EGPC), Palestine Street, 4th District, New Maddi, Cairo

India

N. Biswas, Secretary, Directorate General of Technical Development, Government of India, New Delhi

Lalitha B. Singh, Adviser (Petrochemicals), Department of Chemicals and Petrochemicals, Government of India, New Delhi

Sujit Banerjee, Product Group Manager (Marketing), Polyolefins Industries Ltd., Bombay

M. S. Patwardhan, Executive Vice-Chairman, National Organic Chemical Industries Ltd., Bombay

R. K. Dasgupta, Director (Commercial), Engineers India Ltd., New Delhi

Kirit M. Mehta, President, The All India Plastics Manufacturers Association, Jehangir Building (3rd floor), 133 M. G. Road, Bombay

J. S. Anand, Director, Central Institute of Plastics, Engineering and Technology, Madras

S. K. Mukherjee, Director (Personnel), Director-in-Charge (Projects), Indian Petrochemicals Corporation Ltd., Vadodara

C. M. Lamba, General Manager (Marketing), Indian Petrochemicals Corporation Ltd., Vadodara

S. Dutta, Principal, Petrochemicals Management Development Institute, Indian Petrochemicals Corporation Ltd., Vadodara

Indonesia

M. Sugandi Ratulangi, Jalan Cempaka Putih Tengah 20B/8, Jakarta Pusat 10510

Iran, Islamic Republic of

Noorollah Vakili, Project Manager, Behran Oil Company, 21 Street, Khalid Eslamboly Avenue No. 1, Tehran

Ali Monzavi, Managing Director, Behran Oil Company, 21 Street, Khalid Eslamboly Avenue No. 1, Tehran

Mohammed Saberian-Boroujeni, General Manager (Research and Development), Abadan Petrochemicals, National Petrochemicals Company, No. 46, Karim Khan Zang Avenue, Tehran

Faiborz Mohammadi Korheili, Managing Director, National Petrochemicals Company, No. 46, Karim Khan Zang Avenue, Tehran

Libyan Arab Jamahiriya

A. Mansor, Engineer, General Company for Chemical Industries (GCCI), P. O. Box 100/411, Abu Kamesh

M. Faroum, Engineer, General Company for Chemical Industries (GCCI), P. O. Box 100/411, Abu Kamesh

Pakistan

W. M. Butt, Managing Director, Technology Management International Ltd. (TECHMA), 31-E-I, Gulberg-III, P. O. Box 3220, Gulberg

Spain

Francisco Rodriguez Ortega, Director de Operaciones, La Armentera S/N, 22400 Monzón (Huesca)