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Global Preparatory Meeting
for the Regional Consultation on the
Petrochemical Industry in the Arab Countries

Karachi, Pakistan, 10-13 December 1991

Report

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System of Consultations Division, Department for Industrial
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edited.**

Preface

1. The Second General Conference of the United Nations Industrial Development Organization (UNIDO), held at Lima, Peru, in March 1975, and subsequently endorsed by the United Nations 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 co-operation.

2. In May 1980, the Industrial Development Board decided to establish the System of consultations on a permanent basis, and in May 1982 it adopted its rules of procedure (The System of Consultations, PI/84) setting out its principles, objectives and characteristics, notably:

- The System of Consultations shall be an instrument through which the United Nations Industrial Development Organization (UNIDO) is to serve as a forum for developed and developing countries in their contacts and consultations directed towards the industrialization of developing countries;
- Consultations would also permit negotiations among interested parties at their request, at the same time as or after consultations;
- Participants of each country should include officials of governments as well as representatives of industry, labour, consumer groups and others, as deemed appropriate by each government;
- Final reports of consultations should include such conclusions and recommendations agreed upon by consensus among the participants; the report should also include other views expressed during the discussion.

3. Forty-four consultation meetings were convened since 1977 covering petrochemicals, fertilizers, pharmaceuticals, capital goods, iron and steel, agricultural machinery, leather and leather products, vegetable oil and fats, food-processing, industrial financing, training of industrial manpower, wood and wood products, building material, etc. Three consultation meetings on the petrochemical industry were held in Mexico City (1979), Istanbul (1981) and Vienna (1985).

4. During the second session of the General Conference of UNIDO, which was held at Bangkok, Thailand, 9-13 November 1987, a number of Arab delegates expressed the desire to hold a regional consultation on the petrochemical industry in the Arab countries. Both the Arab Industrial Development and Mining Organization (AIDMO) and the Organization of Arab Petroleum Exporting Countries (OAPEC) expressed the desire to co-operate with UNIDO in organizing such a consultation. This interest was also expressed by the Gulf Organization for Industrial Consulting (GOIC), an intergovernmental Arab Organization.

5. In the framework of UNIDO co-operation programme, both UNIDO and AIDMO have agreed in their communique of 18 February 1988 to jointly implement, in co-operation with OAPEC, a regional consultation on the development of the petrochemical industry in the Arab countries.

6. A preliminary meeting for this consultation was held at Baghdad, 19-20 February 1989, and the first preparatory meeting was held in Vienna, 26-29 September 1989, where a set of conclusions and recommendations were reached, including the commitment of co-operating organizations to undertake a number of studies for the consultation. The Asian-Arab Preparatory Meeting for the Regional Consultation on the Petrochemical Industry in the Arab Countries, held at Karachi, Pakistan, from 27 to 30 November 1989, gathered a large and representative group of experts from Arab and Asian countries.

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I. Introduction

A. Background of the Meeting

7. Petrochemical products have become a necessity of everyday life in both the industrialized and the developing countries. With the coming on stream of new complexes in the Middle East, Arab countries have begun to make an impact on the global petrochemical industry. By the turn of the century, when these countries will have a population of 250 million, the regional demand for intermediate and consumer commodities manufactured from petrochemicals to meet the basic needs for food, clothing and housing will grow considerably: thus, the need for the development and the integration of the sector becomes self-evident.

8. The petrochemical industry has played a vital role in the development of the world economy; and the wide range of its products has enriched the economic welfare of humanity at large. The Arab region was chosen for the Regional Consultation because of the particular advantages it has: the availability of large quantities of natural gas and crude oil; relatively easy access to investment capital; and still uncapped potential markets for consumption.

9. However, in order to make the best use of this industry in the region, there is a need at the policy level: first, to integrate this industry in national economies and maximize its contribution to the total accelerated economic growth of the countries concerned; and, secondly, to increase and enhance co-operation, co-ordination and integration within the region itself and with other regions, particularly in Asia and Africa.

10. Although a considerable degree of economic and technical co-operation exists at present between the Arab region and other countries in the continent of Asia and the Pacific and Africa, there is still ample scope for extending further this co-operation.

B. Objectives of the Meeting

11. The objectives of the Global Preparatory meeting were the following:

- To identify within the broad themes established above, the specific issues of priority to be submitted to the
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Regional Consultation on the petrochemical industry in the Arab countries,

- To elaborate on the current situation of the global petrochemical industry in general and in the Arab countries in particular with the view to identifying the constraints and opportunities for the development of the sector in the Arab region.
 - To identify ways and means for sub-regional, regional and international co-operation and action needed to overcome identified constraints including technical co-operation and investment projects.
 - To assess the pre-requisites for the integration of the petrochemical industry within the national economies of the Arab countries.
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II. Conclusions and Recommendations

12. The Global Preparatory Meeting established the following five issues to be submitted to the Regional Consultation on the Petrochemical Industry in the Arab Countries:

- Cooperation, coordination and integration in the field of petrochemicals
- Marketing of petrochemicals
- Impact of technology on the petrochemical industry
- Infrastructure considerations
- Environmental protection and safety

13. The Global Preparatory Meeting commended the Secretariat for the quality and scope of the substantive preparations, illustrated by the following five documents submitted by the UNIDO Secretariat:

- Study of trends in technological development in the petrochemical industry.
- The development of integrated petrochemical industry in the Arab region.
- Current world situation in petrochemicals 1991
- Report of the Asian-Arab Preparatory Meeting for the Regional Consultation on the Petrochemical Industry in the Arab Countries.
- Directory of technological capabilities in the developing countries related to the petrochemical industries.

14. The Global Preparatory Meeting, after some in-depth discussions of the topic raised in the above documents and verbally presented by the representatives of the UNIDO Secretariat, formulated the following recommendations.

Cooperation, coordination and integration in the field of petrochemicals

15. The Global Preparatory Meeting recommended that regional and international cooperation in the petrochemical industry should be based on clearly defined objectives of mutual benefit to the parties concerned. Such cooperation should extend to cover the whole range of activities related to the sector such as information, investment, trade, marketing, production sharing, technology transfer, R&D and development of manpower training.

16. For such cooperation to be feasible and effective, it was judged necessary that a proper information system network should be created to serve the particular requirements of the industry.

The access to the network should be made available to all interested parties, including producers, consumers and others. Such information would be particularly valuable for cooperation in areas where high capital expenditure, limited market size etc. were involved, enabling the pooling of resources, particularly in areas such as engineering services, equipment manufacturing and the establishment of centres of excellence etc.

17. To facilitate the process of regional and inter-regional cooperation, implementation of periodic and specific market surveys was judged necessary. Surveys should aim at assessing market - supply and demand balances for the identification of opportunities for new investment, etc.

18. As appropriate mechanism should be maintained and innovative schemes should be established to ensure the availability of adequate forums for the collection, exchange and transfer of information and experience at the regional and international level pertaining to all aspects of the petrochemical industry. UNIDO and other agencies were encouraged to continue their valuable efforts to that effect.

19. It was pointed out that the downstream petrochemical industry, which serves such vital needs of the population as clothing, food, water management, construction and health care, provided a wide range of opportunities for the development of the petrochemical sector itself, on one hand, and regional cooperation among countries on the other. Thus, when formulating national industrial policies in the sector, due importance should be given to that segment of the industry.

20. The Global Preparatory Meeting also formulated a number of proposals relating to regional and international cooperation in the context of issues of the Meeting i.e., marketing, technology, infrastructure and environment and safety.

21. It was also judged that the lack of adequate financial resources remained, in most cases, a serious constraint in the development of the petrochemical industry in the region and that regional and international efforts should be made with a view to attracting investment capital from all available sources, including international and regional development financial institutions and through joint venture and other cooperative arrangements.

Marketing of petrochemicals

22. With a view to developing the markets for petrochemical products in the region and in other developing countries, it was thought expedient to establish or strengthen existing application development centres; particularly with respect to the new uses for downstream petrochemical products.

23. An effective marketing strategy for petrochemical finished products would require adequate provision of the following:

- Availability
- Prices
- Specifications
- Customer orientation

24. The Meeting also concluded that, in many developing countries, the marketing effort for petrochemical products had not kept pace with the other activities in a petrochemical plant and therefore should be given more consideration in corporate strategies.

25. The Meeting also stressed the importance of market information and a transparency of supply and demand balances as an essential element for the identification of investment opportunities and the development of the petrochemical industry in the region.

26. In developing both domestic and foreign markets, a keen awareness of quality control and its proper management was an essential prerequisite to counteract the wide practice of customer preference for imported products over local manufactures.

27. In that context, the Global Preparatory Meeting recommended that the relevant international organizations such as UNIDO, AIDMO, ESCWA, IDB, OEAPEC, GOIC and other governmental and non-governmental organizations should continue their important catalytic role in the exchange of information and experience pertaining to the petrochemical industry.

28. The development and consolidation of domestic markets would not only contribute to the substitution of imported products, thus saving foreign exchange, but also replace traditional products, thereby preserving scarce agricultural and forestry resources for more optimal economic usage.

29. The creation of appropriate networks of information on marketing and market related parameters with the assistance of international and regional organizations was also emphasized.

Impact of technology on the petrochemical industry

30. In order to assure the effective transfer and absorption of imported technology, it was considered essential to strengthen the technological capabilities of the developing countries, particularly in respect to enabling them to provide technical back-up services and to manufacture ancillary equipment, machinery and components locally. In the above context, the interaction of R & D centres, industry and academia was judged

vital to attain technological self-reliance and the ability to adapt to the local conditions and improve upon them.

31. For the effective functioning of R & D centres, the general needs for their services had to be translated into specific and concrete demands by the industry and end users. The ultimate goal of R & D centres (existing or to be established in the region) was to develop indigenous technology, a process which had been traditionally hampered by inadequacies in finance and policies.

32. Since the petrochemical industry was basically technology-driven, there was an urgent need to keep abreast of the continual technological changes shaping the industry. It was suggested that UNIDO and other international agencies should undertake the preparation of a directory on the technological innovations and emerging technologies effected on a global basis in order to provide the decision makers in the sector with a sound basis for their investment decisions on technological options.

33. Specialist R & D centres, such as those for plastics in agriculture and water use and management, for construction and engineering, had also served useful purposes in both satisfying the needs of end users and ensuring the application of quality control and internationally recognized standards.

34. The Global Preparatory Meeting also recommended the examination of the various modalities of increasing the cooperation between R & D centres such as the exchange of scientists, technology workshops and joint research effort, in the region and among other developing and developed countries. The efforts employed in the establishment of R & D centres in various countries by UNIDO and other agencies were appreciated and their continuation warmly recommended.

35. In the context of technology transfer and development, the crucial role of human resource training was emphasized. In the transfer of technology packages negotiated by developing countries, the provision for local training should be given added importance to ensure the proper assimilation of technology, which was a prerequisite for the efficient operation of industry.

Infrastructure

36. The importance of infrastructure was illustrated by the fact that, on many occasions, otherwise viable petrochemical and other process industry projects were not implemented in the light of prohibitive costs associated with the development of the required infrastructure.

37. It was recommended that in contemplating new investment projects in the sector, the capital expenditure and the operating costs of infrastructure should be adequately taken into

consideration by both the investor and the public authorities. In that context, it was recalled that as the physical infrastructure in the petrochemical industry also served the national economy and social welfare at the same time, in addition to the requirements of the petrochemical industry, its cost of establishment could not be attributed to the petrochemical complex alone. In developing countries, a lack of recognition of the above had often led to the abandoning of projects due to their incompetitiveness caused by the capital requirements of infrastructure, particularly in under-developed locations, in the light of the high initial costs involved in the creation of such infrastructure.

38. The Global Preparatory Meeting recommended that proper planning would have to be strictly observed to secure the provision of appropriate infrastructure facilities prior to embarking on the construction of the petrochemical plant itself.

39. The development of petrochemical infrastructure should be viewed in its entirety, which included the such components as feedstock, human, organizational, technology and financial aspects, and other strong inter-linkages. In the development of the human and organizational infrastructure, emphasis was put on the need for developing appropriate training facilities at the technological, managerial and scientific levels.

Environmental and safety considerations

40. The Global Preparatory Meeting concluded that there was an urgent need for the formulation of appropriate policies on safety and environmental protection by national Governments and adequate mechanisms for their implementation.

41. The need was stressed for conducting comprehensive environmental impact assessments when considering the establishment of new plants and for carrying out regular environmental audits in existing petrochemical plants.

42. For the elimination of hazardous wastes and poisonous chemicals, the Global Preparatory Meeting identified a serious shortage of regulatory bodies at both national and international levels and recommended the creation of appropriate bodies to detect, monitor and check such disposals.

43. The problem of environmental pollution could often be traced back to the inefficient use of raw materials and energy in petrochemical plants, which could be largely counteracted by the proper selection of process technologies and the efficient operation of complexes, together with adequate training of operating personnel. In that connection, the attitude of the top management towards safety and the environment was judged to be crucial. In the light of the nature of environmental pollution

and safety aspects, those fields lent themselves well to regional and international cooperation.

44. There was general consensus on the need for public awareness of environmental protection and safety, and it was stressed that a programme of public awareness should be embodied in the national policies and appropriate legislation should be enacted.

45. It was also acknowledged by the Meeting that public awareness of issues of environment and safety in recent years had caused considerable pressure to be put on policy makers, government officials and industry in their decision-making for investment projects in the petrochemical field.

III. Organization of the Meeting

A. Opening

1. Statement of Mr. M.H. Chaudhry Chairman, PERAC

46. On behalf of PERAC, the members of the organizing committee and UNIDO, Mr. Chaudhry extended a warm welcome to all participants.

47. He then stated that the petrochemical industry was one of the giant pillars in the growth of world economy. Products produced by the industry had out-classed traditional materials like wood, metal and similar construction materials, as well as provided new dimension to the methodology of human work in agriculture, food, packing, pharmaceuticals, space, communications, electronics, households and furniture industries.

48. It was also noteworthy that the petrochemical industry was the single most challenging enterprise, which emerged from a vast wealth of natural resources, including crude oil and natural gas. The industry provided endless opportunities for economic development to the countries around the world. The technological structure of the industry opened the doors of cooperation, coordination and integration among the countries. A combined refinery and petrochemical complex was an outstanding example of vertical integration; the parallel expansion of production activities in the same plant or in other plants located in the same country or region was a good example of horizontal activities.

49. The dramatic changes in political structures were bound to affect the industrialization process, so vital for the economic development of countries. The collective challenge of new blocks would be hard to counteract unless a free exchange of information, observations and experience among the countries within the regions were established.

50. In other words, ways and means had to be found to bring the resources together for increasing profitability, countering outside pressures and raising the standard of living in the region. Numerous opportunities were available for fruitful cooperation in the production of basic, intermediate and finished petrochemicals. The Meeting provided a great opportunity for the delegates to discuss, exchange views on and provide remedial

proposals for the problems faced by the petrochemical industry at the country, regional or interregional level. He expressed his confidence that delegates to the Meeting would take full advantage of the opportunity and pave the way for stability, prosperity and self-reliance.

51. He concluded by saying that Pakistan, having supportive raw material, a suitable infrastructure, an abundance of land and skilled manpower and a large population base, was ready to contribute in the development of the regional industrial base. The agrarian economy had an unsaturated market for pesticides, insecticides and fertilizers and the per capita consumption of petrochemical products was increasing. Those factors, aided by the government open-door policy, were attractive ingredients for joint ventures in the region in the field of petrochemicals.

2. Statement of H.E. Mr. Islam Nabi
Federal Minister of Production
Government of Pakistan

52. Mr. Nabi started his address by stating that among those present were representatives of countries that were blessed with the wealth of oil, and it would be only fair and just if their thoughtfulness in using that wealth for the development of their industrial base, thus contributing towards the overall industrial development of the region as a whole, were appreciated.

53. Countries around the world, realizing the importance of regional cooperation, had started setting up free trade areas in their respective regions. Those countries were making optimal use of their natural resources and services by using factors of production and economies of scale, thus enjoying the competitive advantages over other.

54. Petrochemical products had become a necessity of everyday life in both the developed and the developing countries because of their ready acceptability by the consumers. Up to recently, western countries had supplied most of the petrochemicals to the world market, but with the coming on stream of new complexes in the Middle East the position was rapidly changing.

55. If basic needs for food, clothing and housing were translated in terms of intermediate and consumer products manufactured from petrochemicals, it would be clear that the market in developing countries offered ample opportunities.

56. In Pakistan, the development of the petrochemical industries had been rather inadequate, apart from the fertilizer and polyester fibre and filament yarn industry. With the country's sizable market, raw materials such as natural gas and by-products of oil refining, the availability of skilled manpower and other infrastructure, the prospects for setting up additional petrochemical plants were very encouraging. With the projects under implementation and planning in the refining sector of the country, especially of the Iran-Pak Joint Venture refinery, the country would have appreciable surplus of naphtha to justify a naphtha cracker plant. Provisions had therefore been made in Pakistan's eighth five-year plan to establish a basic petrochemical plant and terephthalic acid and ethylene glycol plants.

57. He further stated that the demand for petrochemicals in Pakistan was increasing rapidly with the growth of the population, the increase in GNP and the growing realization of the need to substitute conventional materials by petrochemical

materials. The estimates of the demand for some of the major petrochemical intermediates by 1997/98 had been made at more than one and half million tons. If local availability of those petrochemical materials were ensured through domestic production, the demand figures could be much higher.

58. The present Government in Pakistan was determined to bring about an industrial revolution in the country and had recently announced a very attractive incentive package for private and foreign investment in the country. The present Government was not only going all out by providing an attractive package of incentives and a good investment climate to the investor but also privatizing the existing industrial units operating in the public sector. The Government firmly believed that good for the common people could not be achieved without rapid industrialization in the country. The environment therefore was very conducive for private investment in Pakistan, especially in the petrochemical sector.

59. He concluded his remarks by congratulating UNIDO and PERAC for organizing the Meeting and making it possible to assemble delegates and experts from many countries around the world along with experts from Pakistan to participate in the discussions. He wished all the foreign delegates a pleasant stay in the country.

3. Statement of UNIDO Representative

60. A UNIDO representative welcomed the delegates representing the petrochemical industry to the meeting, particularly H.E. Mr. Islam Nabi, Federal Minister for Production. He opened his speech by saying that the petrochemical industry had been successfully expanded by many countries in recent years. It was growing at a respectable rate in spite of the current economic difficulties facing in the world economy. Moreover, it was an industry which lent itself to international cooperation, especially regional cooperation.

61. The UNIDO System of Consultations had in the past generated many innovations, particularly with respect to technological alternatives, integrated development and contactual arrangements. The many opportunities it provided had led to the implementation of projects in technical assistance, investments and technology transfer. By virtue of its consensual and normative character, the System had revealed itself to be eminently suited for fostering international cooperation and for assisting Member States in the formulation of policies and strategies for industrial development.

62. This Global Preparatory Meeting was jointly organized by UNIDO and PERAC. He stated that PERAC had had a long tradition of cooperation with UNIDO. He was very proud of that tradition, which should be continued and consolidated in the future.

63. The Arab Industrial Development and Mining Organization (AIDMO), the Organization of Arab Petroleum Exporting Countries (OAPEC), and the Gulf Organization for Industrial Consulting (GOIC) were cooperating with UNIDO in organizing the Consultation Meeting on the Petrochemical Industry in the Arab Countries.

64. He then stated that the petrochemical industry had played a vital role in the development of world economy, and the wide range of its products had enriched the economic welfare of humanity at large. The Arab region had been chosen for the Regional Consultation because of the particular advantage it had compared to other regions, such as the availability of large quantities of natural gas and crude oil, relatively easy access to investment capital and still untapped potential markets for consumption.

65. However, in order to make the best use of the industry in the region, there was a need at the policy level: first, to integrate this industry in the national economy and maximize its contribution to the total accelerated economic growth of the countries concerned; and, secondly, to promote effective co-

operation, co-ordination and integration within the region itself and with other regions, particularly in Asia and Africa.

66. Although a considerable degree of economic and technical co-operation existed at present between the Arab region and other countries in the world, particularly developing countries, there was still ample scope for further extending that co-operation.

67. In order to make cooperation in the petrochemical industry possible, it was generally felt that a proper system or network of information should be created. Such a network should be made readily available to all countries, producers, consumers and other beneficiaries in the region(s). Information would be particularly effective for cooperation in areas where sharing of high costs and pooling of scarce resources were needed, such as for the establishment of new petrochemical complexes, regional engineering services, equipment manufacturing, and centres of excellence.

68. The petrochemical industry, being a science-based and technology-intensive sector, required both producers and downstream processors to keep abreast on a continuous basis of the rapid technological development involved in the industry. In order to ensure that it would be necessary to establish at the national level adequately equipped R&D centres to cater to processors and producers alike and to be able to advise producers and adapt products according to the needs of the consumers.

69. The development of a manpower and organizational infrastructure required appropriate training facilities at the technical, managerial and scientific levels and the establishment of the proper linkages between those institutions at the sub-regional and regional level. Institution building at that level should also involve the creation of mechanisms for appropriate linkages between universities, R&D centres, industry and other scientific institutions. Adequate government financing should be provided to equip and maintain the operation of such institutions at an effective level.

70. In conclusion, the UNIDO representative once again extended his most sincere thanks and appreciation to PERAC, and through it, to the Government of Pakistan for so graciously volunteering to host such an important meeting.

B. Summary of Discussions

71. A member of the Secretariat gave a brief account of UNIDO's activities in the field of petrochemicals. Those activities, as described, ranged from the implementation of technical assistance projects, study tours and fellowships, and the establishment of R&D centres to implementing R&D projects and setting up petrochemical plants. One example given was the 5 million tons/year refinery in Viet Nam.

72. In the succeeding discussions, the participants reaffirmed the need for UNIDO's continued assistance, particularly in the following spheres:

- Technology transfer
- Environmental protection
- Improvement of R&D centres
- Development of innovative information services and facilities
- Technical guidance in establishing regional development centres

73. UNIDO's approach in technology transfer consisted of establishing joint ventures, the implementation of R&D projects and the establishment of training centres. In addition, it was pointed out by some participants that R&D centres should converge on the development of cost-effective technologies to cut costs and raw material input. Elaborating UNIDO's possible contribution to environment and safety, it was reported that UNIDO could provide guidelines in the creation of testing facilities in conjunction with governments' formulation of enforceable environmental policies.

74. A UNIDO representative stated that, although UNIDO delivered technical assistance to the developing countries as a routine and primary activity of the Organization, the main objective of the System of Consultations was to provide a unique sectoral forum to discuss obstacles and problems in the specific sectors and identify concrete and pragmatic solutions for their removal in order to accelerate the industrialization of developing countries.

75. With respect to the need for information services, the participants felt that economic growth in the region had led to a significant increase in technical and industrial investment and the transfer of the investments to include modern technologies. Noteworthy had been the investment growth in the field of informatics during the last few years. Due to that development, it was regarded imperative to establish coordinated information

service centres, and UNIDO recommended that countries should take advantage of its expertise in the field.

76. Participants were unanimous in identifying the lack of information as a major stumbling block to the development of the petrochemical industry, on the one hand, and to regional and international cooperation on the other. Therefore, the establishment of a computerized database management system containing all the relevant information was considered a necessity for the further development of the industry and for enhanced cooperation both between the countries of the region and with the industrialized countries.

77. The necessity to develop regional development centres was found by many participants equally essential in order to provide assistance to the end-users of the petrochemical products, while simultaneously developing each country's competence and capability. That issue was correlated with the consideration of improving the limited markets, improving of quality control processes, and alternative modes of waste disposal.

78. The current predicament of marketing in the region was considered by the participants to be the problem of: over-production, which far exceeded the limited capacity of the market to absorb petrochemical products; the absence of a specialized marketing company; the underpricing of products by producers to secure their market shares; and the prohibitive cost of setting up marketing schemes. Two fundamental considerations regarding those problems were brought up:

- Securing of competitive products' prices in terms of a better selection of products, better planning and the lowering of tariffs
- The establishment of regional development centres for specific products

79. Participants welcomed the idea of establishing regional development centres in a cooperative way. Taking into consideration the limited capacity of the market, they urged that the objectives of such centres should be to design of downstream petrochemical processes and to promote petrochemical industries. Emphasis was put on education to discover innovative uses of petrochemical products appropriate to the region.

80. In answer to the foregoing assertion that there was no available market to absorb the increasing production of petrochemical products, it was argued that, since only Saudi Arabia and Turkey were currently exporting petrochemical products from the region, a potential market was still available in other countries of the region. It was argued that since the demand for plastic was high, local markets in other countries should also be regarded as potential markets.

81. All participants agreed on the central importance of developing domestic markets of developing countries for petrochemical products. The downstream processing industry lent itself very well to that purpose, where increased use of polymers in construction, agriculture, communications, textiles and pharmaceuticals offered a tremendous potential for market development. However, for the above to be achieved, a number of conditions pertaining to customs/tariffs, supply/demand balance, market-intelligence, after-sale services, infrastructure etc. must be met.

82. Participants also addressed the problem that the petrochemical industry suffered from cancellations of planned projects and the non-competitive market price of products due to the prohibitive costs required in acquiring technology. In relation to that problem, some background on technology development was given focusing on the following points: transfer of technology, absorption of technology, R&D centres, creation of science and technology centres, and process technology (with emphasis on energy conservation). As to the trends of developing technologies in the countries of the region, the following measures were considered to be prerequisites:

- Licensing of technology
- R&D, human resource development and assimilation of technologies
- Implementation of R&D projects and coordination between national research units and other organizations
- Collaboration for development of technologies
- Collaboration between R&D centres, universities, scientific research institutions, and industry
- Creation of scientific research and development councils and joint ventures

83. Since the participants believed that the subject of infrastructure was very suitable for regional cooperation, a session was earmarked during the discussions on infrastructure development. Before embarking on solutions, infrastructure was defined as pertaining not only to the physical utilities and transportation facilities but also to the current technical, legal, managerial and organizational support facilities. The following points were made by the participants:

- The existing infrastructure should be identified in order not to start from grassroots level but from the available infrastructure
- Infrastructure should match the investment requirements of the project itself
- Since infrastructure cost often exceeded the capital cost of any petrochemical projects, Governments should assist in the creation of proper infrastructure facilities

- Site selection should go along with good infrastructure development
- Suppliers of raw materials should participate in infrastructure building

84. The participants united in confirming that environmental issues were now being taken seriously in their own countries due to internal and external pressures, as well as the implications of detrimental consequences in terms of wasted financial resources and degradation of environmental quality caused by industrial activities and accidents.

85. Elaborating the topic, UNIDO presented four basic considerations in conjunction with environmental and safety problems, namely, efficiency in using materials, disposal of wastes, legislation on specifications needed, and training.

86. UNIDO then was invited by the participants to advise on standards and specifications in terms of permissible emissions and disposal of by-products. In addition, it was pointed that training was needed not only by professionals but also by the public, schools and mass media and that safety audits, good housekeeping and awareness of the masses should be promoted.

IV. Annexes

Annex I - Agenda

Tuesday, 10 December 1991

- 09.00 - 09.45 **Registration**
- 09.45 - 11.15 **Inaugural Session**
- 10.00 **Welcome Address by PERAC Chairman**
Address by Secretary, Ministry of Production
Address by UNIDO Representative
Address by Chief Guest
- 12.30 - 13.00 **Election of the Chairman and adoption of the agenda**
- 14.30 - 16.00 **First Working Session**
- Brief review of UNIDO's activities in the petrochemical industry with emphasis on preparatory efforts for this meeting and for the Regional Consultation*
- Objectives set for the global preparatory meeting*
- 16.30 - 18.00 **Second Working Session**
- Brief presentation of present status and future prospects of the petrochemical industry in the Arab Region*
- Third Working Session**
- Discussion of the main themes of the Regional Consultations; cooperation, coordination and integration in the Arab Petrochemical Industry*

Wednesday, 11 December 1991

- 09.15 - 10.45 **Fourth Working Session**
- Discussion of the main themes of the Regional Consultation; marketing of petrochemicals*
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- 11.15 - 12.45 **Fifth Working Session**
Discussion of the main themes of the Regional Consultation; technological development
- 14.00 - 15.30 **Sixth Working Session**
Discussion of the main themes of the Regional Consultation; infrastructure
- 16.00 - 17.30 **Seventh Working Session**
Discussion of the main themes of the Regional Consultation; environment and safety

Thursday, 12 December 1991

- 09.15 - 10.45 **Eight Working Session**
Identification of issues to be submitted to the Regional Consultation
- 16.00 - 17.30 **Closing Session**
*Adoption of the Report
Note of thanks by PERAC Chairman
Note of thanks by UNIDO Representative*

Friday, 13 December 1991

- 10.00 - 12.30 **Technical plant visit and sight-seeing**
-

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