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WORLD CHANGES IN THE STRUCTURE
OF THE
PETROCHEMICAL INDUSTRY 1980 - 1983*

Prepared by the

UNIDO secretariat

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INTRODUCTION

1. The aim of this paper is to present a brief overview of the changes occurring in the structure of the petrochemical industry with a view towards identifying possibilities for international co-operation opened by restructuring. Global restructuring trends are illustrated by examining the three commodity chemicals most affected by restructuring: ethylene, polyvinyl chloride (PVC) and low density polyethylene (LDPE). Figures for the other thermoplastics that were studied in preparing the paper, high-density polyethylene (HDPE), polypropylene (PP) and polystyrene (PS), are given for comparison where relevant.

2. Restructuring in the petrochemical industry, as used by industry, is taken to mean long-term changes within the industry in the composition of output and the allocation of resources. This entails both shifts within countries or regions in the pattern of products produced and shifts between regions in terms of shares of total production of petrochemical products.

3. The paper presents first the main trends in the development of the petrochemical industry in the 1970s and early 1980s, with special attention to the situation in developing countries. It then examines restructuring in the industry by looking at the present structure and structural changes taking place, concentrating on the petrochemicals most affected by restructuring and the regions most affected by capacity closure. Quantitative data that is illustrative of the restructuring process and which has been compiled by the UNIDO Secretariat is presented in the form of graphs and tables as Annexes to the report.

I. Evolution of the petrochemical industry

4. Before 1973 the rapid development of the petrochemical industry was based on expanding markets for synthetic substitutes for natural materials. Lower prices of the main raw material, naphtha, and technological advances leading to improved product performance and more efficient production methods enabled petrochemical products to maintain their cost edge over traditional products and made possible the industry's high growth rate.

5. Developments in the petrochemical industry since 1973 have been greatly influenced by the impact of three events. The first was the oil price increase in 1973, which increased the price of oil-based feedstocks, specifically naphtha, fourfold. The second was the oil price increases and reduction in supply in 1979 that again more than doubled feedstock prices. The third was the severe and prolonged world economic recession at the beginning of the 1980s. The effects of these elements on different groups of countries have been different, so they will be analyzed separately.

A. The petrochemical industry in developed countries

6. The developed market economy countries have experienced a deceleration in the growth of demand for petrochemicals, caused by market saturation at the price levels reached. A number of elements played a role in this, including the increases in feedstock prices and increased production costs, which reduced the price advantage of petrochemical products over the natural materials for which they were substitutes and growing competition from other suppliers, in particular oil companies. Continued expansions of capacity, particularly for ethylene and the thermoplastics derived from it, led to a severe situation of overcapacity in 1980, making it necessary to undertake a programme of restructuring, including plant closure and idling.

7. Eastern Europe experienced a period of major capacity expansion in the 1970s. Large petrochemical complexes were constructed, often based on buy-back agreements with Western European engineering contractors. At the beginning of the 1980s the industry's growth rate was reduced because of a somewhat restricted supply of feedstocks, most of which came from the U.S.S.R. In addition, and in order to increase foreign exchange earnings, a part of the production earmarked for domestic consumption was diverted to export. The limited feedstock availability and the problem of foreign debt have meant that plans for construction have been significantly slowed down, but they have not been cancelled.

B. The petrochemical industry in developing countries

8. The developing countries experienced the events of the last decade somewhat differently. For instance, countries endowed with petroleum resources were encouraged by the expanding domestic and export markets for petrochemicals to take advantage of their supply of feedstocks and increased oil revenues to invest in constructing new petrochemical complexes. In particular, associated gas that had previously been flared became economically advantageous as a low priced feedstock for developing a petrochemical industry. The 1970s saw major plant construction programmes in developing countries. Most of the new capacity came onstream after 1975; 90 per cent of it was concentrated in 10 developing countries.

9. Developing countries face an entirely different situation in the 1980s. Some elements of this situation are the oil glut, meaning falling oil prices and falling revenues, the slow recovery of the developed countries from the world economic recession, the persistent effects of the recession in developing countries, overcapacity in petrochemicals in the developed countries, high interest rates and investment costs and, in many countries, heavy burdens of external debt. All of these factors have meant that the construction of several petrochemical complexes has been cancelled or postponed, while other projects are subject to significant delays and reductions in scale (see Table 3).

10. In Africa, Nigeria had plans to build a major petrochemical complex, taking advantage of its feedstock resources, specifically flared gas. The Government is continuing its efforts to construct the complex, but it is expected to take considerably longer than originally planned. In the rest of Africa there are presently no known plans for world-scale plants.

11. In the Middle East, only Saudi Arabia has continued its construction programme on schedule. All other countries in this region have slowed down or postponed construction on projects, a number of which were originally planned as export-oriented.

12. The world economic recession has not affected all developing countries equally, in particular in Asia. The East Asian countries have had a better performance than most developing countries, despite the abrupt slowdown due

to loss of cost competitiveness stemming from high naphtha prices. The main export-oriented petrochemical producing countries, such as Korea, after a relative slowdown in 1982 and part of 1983, again exhibit dynamic growth due to the economic recovery of major developed countries and an enhanced package of Government incentives. They are, however, following a more cautious approach than in the 1970s. India and China are producing mainly for domestic markets and have therefore not been strongly affected. ASEAN countries, particularly Indonesia, have postponed construction plans, and in Singapore a fully-built complex stood idle for a year in 1983.

13. In Latin America the debt problem has practically stopped construction in the petrochemical industry. Only Mexico will complete its complex already under construction. However, another factor in Latin America is the employment of defensive mechanisms by Governments to assist the industry. Since the beginning of the 1980s, major countries such as Mexico, Argentina and Brazil have been giving export incentives for selected product lines. Companies taking advantage of these Government incentives have been able to become quite competitive on world markets.

II. The process of restructuring in the petrochemical industry

A. Changes in the global structure of the petrochemical industry

14. Regional shares of world production and consumption of petrochemicals changed considerably during the 1970s and are in the process of further changes. For example, in 1975, developing countries accounted for 8 per cent of the world consumption of basic petrochemicals and 15 per cent of that of end products, but they produced only half of the amount they consumed. During the period between 1975 and 1981, while production and consumption of petrochemicals grew by 50 per cent world-wide, it more than doubled in the developing countries.

15. As can be calculated from the figures in Table 1, which shows the world situation in petrochemicals in 1981 and 1983, the share of the developing countries in total world production of the main end petrochemicals grew further, from 12 per cent in 1981 to 15 per cent in 1983, whilst for ethylene it grew from 9 to 10 per cent. These increases in production contrast with their share in world consumption of end petrochemicals, which only grew from 20.2 per cent to 20.8 per cent in this period, reflecting the severe impact of world recession and external indebtedness on the economies of many of those countries.

16. Since three petrochemical products have been the most affected by the current restructuring, namely ethylene, PVC and LDPE, a more detailed analysis on them has been done. The current trends in the restructuring process can be observed in the amounts of capacity reduction - either permanent plant closure or temporary idling - taking place in some regions, primarily the developed market economies, and capacity buildup going on in other regions, Eastern Europe and the developing countries. This has the effect of changing the regional shares of world capacity.

17. The shares of the developed market economies, with the exception of Canada, are generally declining, while the developing countries and Eastern Europe are increasing their shares. In ethylene for example, the shares of the U.S.A., Japan and Western Europe together have decreased from 90 per cent of total world capacity in 1970 to 80 per cent in 1980 and are expected to be only 55 per cent in 1990 (see figure 5). The figures for PVC and LDPE show similar trends (see figures 10 and 15).

18. The beginning of the 1980s has seen a period of significant capacity reductions in the United States, Western Europe and Japan as the industry responded to a situation of severe overcapacity and stagnating demand growth. The net capacity closures between 1980 and 1983 in these regions are given in Table 2. It can be seen that ethylene capacity has been reduced the most, and low-density polyethylene the second most. This is true for all regions except Japan, where by 1985 HDPE will be the most affected and PVC the second most affected petrochemical.

19. The other side of the restructuring process is illustrated by figures 6, 11 and 16, which show which countries account for the major capacity increases in ethylene, PVC and LDPE. The one developed market economy country that is expanding its share of world capacity in commodity petrochemicals is Canada, which is exploiting its plentiful feedstock resources in Alberta. Among the developed centrally planned economies, the U.S.S.R. is seen to be expanding its capacity considerably. Among the developing countries, China, Brazil, Mexico and Saudi Arabia show the most expansion, but a significant increase is expected from several other developing countries as well.

B. Petrochemicals most affected by restructuring

Ethylene

20. Changes in demand for ethylene, which supports such a large proportion of the petrochemical industry, are a reflection of trends in the industry as a whole. During periods when the industry was growing rapidly, the 1960s and early 1970s, demand for ethylene grew commensurately. Between 1970 and 1979, world demand for ethylene increased from less than 20 million tons per annum to approximately 37 million tpa. As figure 2 shows, there have been two sharp declines in ethylene demand since 1970; The first one was in 1975, following the short-lived demand boom of 1974, and the second decline was the much longer one lasting from 1979 until 1982. Each of these decreases shifted the historical curve of demand growth down to a lower re-starting point and a flatter growth rate, particularly during the 1980s. Future demand for ethylene is expected to show moderate growth, averaging perhaps 3-4 per cent per year, for the rest of the decade.

21. Ethylene production in the developed market economies responded to fluctuations in demand, declining sharply in 1975 after a period of rapid growth and falling off again after 1979 (see figure 3). Production in Eastern Europe during this period grew from approximately 1 million tons in 1970 to more than three times as much in 1980, while production in developing countries, starting at less than 200 thousand tpa in 1970, increased more than tenfold, to approximately 2.7 million tpa in 1980.

22. Encouraged by the tremendous growth in demand for petrochemicals in the 1960s and early 1970s, ethylene capacity expanded extremely rapidly between 1970 and 1980. As figure 4 shows, capacity in Western Europe and the United States, starting from 7 and 10 million tpa respectively, more than doubled in this period. In Japan it grew by 50 per cent, from 4 to 6 million tpa; in Eastern Europe it grew by more than three times its 1970 level to 4.6 million. In the developing countries, not shown in figure 4, capacity grew more than tenfold, from 350 thousand in 1970 to approximately 3.8 million tpa in 1980.

23. As capacity expansion in the 1970s outpaced demand growth, a situation of severe overcapacity was reached in 1980, with capacity utilization levels

of 60 percent in Western Europe, 65 per cent in Japan and 70 per cent in North America. This has forced all three of these regions to reduce capacity significantly since 1980. These capacity reductions are given in Table 2. From this it can be seen that Western Europe has had the most capacity closures, in volume as well as in percentage terms (20 per cent). Japan, when it has implemented its programme of reductions, will be second in volume and first in percentage (35 per cent). The United States industry has shut down over 1.5 million tons, approximately 10 per cent of its ethylene capacity. In Eastern Europe, the capacity and production figures did not change significantly between 1980 and 1983, with capacity utilization staying at about 80 per cent. In the developing countries as a whole, total ethylene capacity actually expanded in 1980-1983, from 4 to 6 million tpa, but capacity utilization was quite poor, approximately 60 per cent in 1983.

24. The problem of excess capacity is expected to continue until 1990; more capacity shutdowns are predicted in Western Europe. The main new capacity likely to come on stream will be those ethylene complexes already under construction, in Saudi Arabia, Canada and Mexico. However, some forecasts mention the possibility that this lack of new construction caused by the present unfavourable investment climate could actually lead to a situation of capacity shortages by 1990.

Polyvinyl Chloride (PVC)

25. Demand for PVC during this period showed similarities to the ethylene demand pattern, falling sharply in 1975 and then recovering until 1979, only to enter a period of prolonged stagnation. While the projected future demand growth rates in developed market economies are quite modest, between 1 and 2 per cent per year, higher rates of growth are predicted for Eastern Europe and the developing countries.

26. Production of PVC in North America, Western Europe and Japan reached a peak in 1974, decreased in 1975, recovered until 1979 and has remained at or below the same level since 1980. Eastern Europe exhibited constantly rising production over the entire period, as did the developing countries.

27. Capacity buildup in PVC could be observed throughout the decade. Western Europe, starting from 3.5 million tpa, representing almost 40 per cent of total world capacity, doubled its capacity by 1980. North America also built up its PVC capacity steadily, from 2 to 3.5 million tpa. Japan stopped adding to its PVC capacity in 1974 and has remained at its 1975 level of 2 million tpa since then. Eastern Europe doubled its capacity, from 1 to 2 million tpa, and the developing countries, starting from approximately 500 thousand tpa, increased their capacity to more than 4 times this figure.

28. Western Europe was the region suffering from the most excess capacity for PVC in 1980, with a capacity utilization of only 60 per cent, which forced the industry to start reducing capacity. Faced with falling demand since 1979, the Japanese industry has also decided on significant capacity reductions (see Table 2). The United States has undertaken only a minor amount of plant closures.

29. Consumption of PVC, as of other thermoplastics, has already reached such high levels in the developed countries that it is not expected to show very high growth rates in the 1980s (1.5-3.5 per cent); however, in the developing countries, not yet faced with mature markets, demand is expected to expand rapidly (by as much as 9 per cent per year). Therefore, total world demand growth, particularly in developing countries, should offer some prospects for new plant construction in the period until 1990. In the Middle East, for example, new plastics plants are planned that will utilize excess ethylene capacity. Other new constructions may follow existing regional characteristics, for example, in Asia intermediates are imported, as they are in Egypt, while in Latin America plastics are mainly produced as part of integrated petrochemical production streams.

Low Density Polyethylene (LDPE)

30. The global demand pattern for LDPE resembled that of ethylene and PVC. In the developed market economies demand fell off sharply in 1975, recovered, and then declined again in 1980. Since 1980 the growth curve has flattened out, and growth is expected to remain slow for the rest of the decade. In the developing countries and Eastern Europe, by contrast, demand has been increasing constantly since 1970 and is expected to continue its rapid growth rate.

31. Production levels of LDPE in 1970 were about 2 million tpa in both North America and Western Europe, and about 1 million tpa in Japan. Production increased greatly until 1974, particularly in Western Europe, where it more than doubled, only to fall abruptly in 1975 and then again in 1980. Production recovered well in the United States after both decreases, but remained at a depressed level after 1980 in Western Europe and Japan. Between 1970 and 1980 LDPE production more than doubled in Eastern Europe, reaching 1.4 million tpa, while it grew from 150 thousand to 1.1 million in the developing countries.

32. LDPE capacity expanded rapidly in Western Europe and North America until 1980, after which severe reductions were undertaken (see Table 2). In Japan, growth levelled off after about 1978, and major capacity reductions are expected by 1985. In Eastern Europe capacity has expanded from less than 600 thousand tpa in 1970 to more than twice that in 1980, and continued growth is expected. In the developing countries capacity started from only 200 thousand in 1970 and expanded sevenfold by 1980.

33. Within the polyethylene markets, the share of linear low-density polyethylene (LLDPE) has grown substantially in recent years, due to improvements in production performance and reduction of investment costs. A number of producers are offering both new plants and retrofittable routes for converting LDPE to LLDPE as the cheapest way to make the latter product. Retrofitting costs are estimated to be only 5 per cent of those of adding new capacity. Further, by improving reaction rates and catalyst performance, the new LLDPE retrofit reactor can increase production capacity up to 2/3 of existing LDPE capacity, with some additional investment. As a spinoff, the multipolyolefin plant, able to produce LLDPE, HDPE and PP in the same facility, has become a reality. Plants with this process flexibility and achieving the cost savings claimed by the leading process developers are expected to dominate the polyolefins market in the future.

C. Regions most affected by current restructuring

34. In the course of the current restructuring process in the petrochemical industry, the regions that are most affected by capacity reduction are North America, Western Europe and Japan. Therefore, these regions are examined more closely below.

35. The reactions of the petrochemical industry in these different countries to the situation of overcapacity caused by the depressed demand for petrochemicals at the beginning of the 1980s in conjunction with the large plant capacities built up during the 1970s have been very different. In the United States the process of capacity reduction has been industry-led, while in Japan these changes in capacity have been co-ordinated by the Ministry of Trade and Industry. In Western Europe, however, the substantial involvement of state-owned enterprises had politicized the discussions held within the European Community and led to delaying essential capacity cutbacks in several petrochemical commodities, in particular plastics and fibers. Hence, an overcapacity situation still persists that will require more severe cutbacks in the future.

36. In order to strengthen the statistical basis for the analysis of the restructuring process three indicators were calculated for the period 1970-1983 for the five major thermoplastics for the three regions most affected by capacity closures. These indicators are the production self-sufficiency coefficient, which measures the degree to which a region can supply its own demand for a product, the trade weight coefficient, which measures the degree of dependence on exports of a product, and the market penetration coefficient, that measures the percentage of consumption that is imported. Market penetration is one indicator of possible opportunities for international co-operation.

Western Europe

37. Western Europe's production of thermoplastics between 1970 and 1983 was more than sufficient to satisfy its demand. The production self-sufficiency coefficients were generally around 110 per cent, except for HDPE and LDPE, which reached peaks of 130 and 140 per cent respectively. The trade weight figures

indicate that exports accounted for between 30 and 50 per cent of production for PVC, HDPE and PP and even more for LDPE and PS. However, a large part of this trade is between countries within the region, which is also reflected in the market penetration figures. Market penetration for PVC, HDPE and PP increased from 25-35 per cent in the early 1970s to between 40 and 50 per cent in the early 1980s. The figures for LDPE and PS increased to as much as 80 per cent.

38. Western Europe is the region suffering from the most severe overcapacity situation at the beginning of the 1980s. According to statistics of the Commission of the European Community, in 1980 Western Europe had 4.9 million tons of unused capacity for ethylene, 1.5 million tons for PVC, 1.7 million tons for LDPE and approximately 1 million tons each for other thermoplastics. This situation was not entirely new, however; in 1973-74 the excess capacity figures were already at about 50 per cent of the 1980 level. Furthermore, our analysis shows that of the three most affected regions, Western Europe was the region most consistently out of tune with the cycles of the petrochemical industry, often adding capacity at times of consumption slowdown.

39. The excess capacity is seen as a major weakness in the industry, leading to high operating losses in the years 1980-1982, despite a price boom. These losses are forcing the industry to restructure. The rate of plant closure is seen as the most visible and most significant indication of progress made in the restructuring process. However, data published on plant closures is not always complete, nor is the distinction between temporary shutdowns, mothballing, and permanent closures always clear.

40. In the period between 1980 and 1983 approximately 3 million tons of ethylene capacity and one million tons of LDPE capacity were closed in Western Europe, as were significant quantities of other thermoplastic capacity, i.e. PVC, HDPE, PP, and PS. The rates of plant closures for individual countries have been very different. The United Kingdom, Federal Republic of Germany and Benelux countries, where the petrochemical industry is more privately owned, have done the most restructuring by means of actual plant shutdowns. In France and in Italy, where more of the industry is state-owned, concern over

unemployment has meant fewer and later closures; plants have mainly changed hands in the reorganization process. In countries with only one major petrochemical complex, such as Sweden, Norway and Portugal, plant closure means creating total dependence on imports and is therefore seen as a measure to be avoided if at all possible. For Sweden restructuring has meant that major parts of its petrochemical industry have been sold to foreign firms.

41. It seems to be generally agreed that in Western Europe more plant closures are still necessary in order to improve the situation of long-term over-capacity, particularly in ethylene and ethylene-based products. According to some industry analysts, 80 of the 250 existing plants in the olefins, polyethylene and PVC sectors are ready for closure, comprising 3 to 4 million tons per annum of ethylene-equivalent capacity. It is felt that more coordination within the European Community is necessary to achieve a balanced restructuring of the industry.

42. The strategy that most petrochemical companies are following now is to look for a different mix of products, where possible moving away from reliance on general purpose grades of commodity petrochemicals to higher value added products to achieve profitability.

Japan

43. Between 1970 and 1980 Japan consistently produced greater quantities of thermoplastics than it consumed. Its self-sufficiency figures exhibited much wider fluctuations than those of the United States and Western Europe in this period, starting generally at more than 140 per cent in 1970, reaching a low of about 110 per cent in 1975, then rising and sinking again, levelling out at between 100 and 110 per cent in 1982-1983. The only exception is PVC, which has declined more or less steadily from 115 per cent in 1970 to 80-85 per cent in 1982-1983.

44. Japan's petrochemical industry was highly export-oriented during the 1970s, exporting between 15 and 30 per cent of production. Exports declined sharply in 1974 after the first oil price increase, recovered rapidly, but then continued at reduced levels. At the time of the production peaks between 1975 and 1978, when the industry was trying to recover its investment as fast as possible, Japan was not able to export a large part of the surplus, but added to its inventories, which it then tried to sell off. The effect of these accumulated inventories continued for several years, until 1982. The trade weights at the beginning of the 1980s have been between 10 and 15 per cent, except for PVC, which fell to between 0 and 5 per cent.

45. The market penetration figures in Japan in the early 1970s resemble those of the United States. The first oil price increase in 1973 was followed by substantial decreases in imports of plastics from 1974 to 1975. There were no imports of HDPE throughout the period. Soon after 1975, imports as a percentage of consumption started to increase, rising to as much as 7 per cent for LDPE and PVC, but declining again in 1983.

46. The major factor determining the direction of development of the petrochemical industry in Japan is the lack of domestic petroleum resources. The fact that the Japanese industry is based on imported and domestically refined naphtha meant that it was particularly hard hit by the oil price increases. Whereas North America and the Middle East were able to take advantage of lower-price ethane resources, Japan did not have this feedstock flexibility and thus had difficulty competing internationally.

47. A second element of the Japanese petrochemical industry has been that it was fragmented into many smaller companies which were weakened by engaging in competitive price cutting domestically. Many of the industry's plants became obsolete, being too small by world standards.

48. The industry's restructuring programme, co-ordinated by the Ministry of Trade and Industry, includes cutting redundant production by closing some ethylene plants, thus leading to a net reduction of total production of ethylene,

for which Japan is a relatively high-cost producer. To date, approximately half a million tons, or 10 per cent, of ethylene capacity has been closed and another half a million has been idled. Further reductions by 1985 are planned. The restructuring strategy includes importing larger quantities of such basic products as ethylene and the upgrading of these to performance products. Besides product concentration, the industry is also instituting co-ordination of its sales, both on the domestic market and for export.

North America

49. In the following discussion of the petrochemical industry in North America, the United States and Canada will be examined separately.

United States

50. The United States produced more thermoplastics than it consumed during the period 1970-1983. Self-sufficiency figures fluctuated between 100 and 110 per cent for PVC, LDPE and PS, and between 110 and 120 per cent for HDPE and PP.

51. Between 1972 and 1982 total U.S. exports of thermoplastics and other ethylene-based products rose at an average rate of 7.5 per cent per year, reaching the equivalent of 2 million tons of ethylene in 1982. During the early 1970s exports accounted for between 5 and 15 per cent of U.S. production of the five major thermoplastics. In 1975 exports of all plastics fell sharply, but between 1975 and 1980 exports of LDPE, HDPE and PP increased again, reaching 15 to 25 per cent of production.

52. Trade weight figures for thermoplastics have declined again at the beginning of the 1980s and this trend can be expected to continue in the future. For ethylene itself the trade weight more than doubled between 1975 and 1983 to over 15 per cent of production. However, the export market for ethylene is no longer expanding, primarily due to competition from lower-cost producers in Canada and the Middle East.

53. Imports of petrochemical products by the United States are a very small percentage of consumption. At the beginning of the 1970s there was almost no penetration of the US petrochemical market at all. The only plastics for which imports have increased to more than 1 per cent of consumption have been PVC, which reached 3.4 per cent in 1983, and HDPE, which has declined to 0.5 again after reaching 2.6 per cent in 1980.

54. During the period 1974-1983, the United States was the major low-cost world producer and exporter of petrochemicals because it had abundant supplies of ethane and liquid petroleum gases available at favourable prices. This encouraged the industry to rapidly expand capacity for ethane-based products, ethylene, PVC and LDPE, up to 1980, when rising prices and saturated markets at these prices created a situation of excess capacity. In 1980 the U.S. capacity utilization was 70 per cent for ethylene, 80 per cent for LDPE and 85 per cent for PVC.

55. Industry responded quickly to low capacity utilization, either by plant idling or by shutdowns. Idling has been mainly applied to ethylene, where nearly 4 million tons of plant capacity was idled. Other petrochemicals, such as thermoplastics, have been less subject to idling. As far as actual plant shutdowns, in the United States the most affected chemicals have been ethylene (1,744,000 tons) and LDPE (828,000 tons). In the PVC industry, so far, plants have mainly changed hands. In other plastics there has been no need for capacity reduction because of sustainable demand.

56. The United States seems destined to lose its position of world dominance in the commodity petrochemical market, in particular in ethylene-based products, because of the growing competition from producers with low-cost feedstocks, e.g., Saudi Arabia. However, the United States is expected to retain its dominance in propylene-based products, where it still holds a comparative advantage.

Canada

57. Because of Canada's relatively smaller domestic market for petrochemicals, the country did not build its first major complex until 1977, when the existence of abundant feedstocks, advantageously priced below world levels by the Government, had created the foundation for the long-term international competitiveness of the Canadian petrochemical industry, particularly in Western Canada. The initial Government policies, proposed late in the 1970s, provided industry with adequate incentives for setting up new world-scale ethane-based petrochemical plants in Alberta Province. However, the changes in world oil consumption and price reductions in the early 1980s practically eliminated Canada's competitive advantage relative to the United States, currently the dominant world petrochemical producer.

58. Now, recent agreements between the federal and provincial government have restored the long-term competitiveness of Canadian petrochemical producers, whose price advantage will increase substantially between 1985 and 1990. Canada is expected to become a major world exporter of ethylene derivatives, especially in the Pacific region, with internationally competitive prices about half way between those of the U.S. Gulf Coast and those of Saudi Arabia, the two largest exporters of petrochemicals.

D. Opportunities for international co-operation opened by restructuring

59. The current global restructuring process is opening a number of opportunities for international cooperation aimed at achieving a better coordinated global supply of petrochemicals, taking account of the needs and potentials of the countries concerned, and optimizing the use of resources currently wasted or left untapped.

60. This paper has presented highlights of the global petrochemical picture by regions and major countries. Together with a recent survey of approximately 50 of the main joint-venture companies in developing countries and about 15 main oil and petrochemical producers in developed countries, it forms the background for a separate paper being prepared by UNIDO, which depicts the possible bases for international cooperation as perceived by the companies surveyed, and a number of opportunities for fostering such cooperation as perceived by UNIDO.

Table 1. World Situation in Petrochemicals
(1000 metric tons)

<u>Region</u>	<u>P R O D U C T I O N</u>							
	<u>Thermoplastics</u>		<u>Synthetic Fibers</u>		<u>Rubbers</u>		<u>Ethylene</u>	
	<u>1981</u>	<u>1983</u>	<u>1981</u>	<u>1983</u>	<u>1981</u>	<u>1983</u>	<u>1981</u>	<u>1983</u>
<u>Developed Countries</u>								
North America	12650	13570	1880	1530	2510	2160	14400	14200
Western Europe	12260	12590	1320	1190	1730	1790	10600	10900
Eastern Europe	3480	4670	630	660	2470	2480	3600	3700
Japan	4350	5570	720	710	1010	1000	3650	3690
Others	860	1030	30	50	60	70	550	600
<u>Developing Countries</u>								
Africa + Middle East	290	290	80	100	20	20	340	350
Asia	2690	3360	1320	1750	270	330	1440	1560
Latin America	1790	2300	260	350	360	380	1350	1800
<u>World Total</u>	38370	43380	6240	6340	8430	8230	35930	36800
	<u>C O N S U M P T I O N</u>							
<u>Developed Countries</u>	<u>Thermoplastics</u>		<u>Synthetic Fibers</u>		<u>Rubbers</u>		<u>Ethylene</u>	
	<u>1981</u>	<u>1983</u>	<u>1981</u>	<u>1983</u>	<u>1981</u>	<u>1983</u>	<u>1981</u>	<u>1983</u>
North America	10970	11900	1580	1580	2230	2080	14300	14180
Western Europe	11950	12095	1140	1140	1730	1670	10600	10800
Eastern Europe	3340	4700	630	640	2450	2400	3570	3680
Japan	3880	4690	470	470	850	850	3640	3690
Others	1060	1450	90	90	160	150	550	600
<u>Developing Countries</u>								
Africa + Middle East	1030	1505	200	220	60	140	340	350
Asia	3960	4640	1730	1800	450	500	1630	1800
Latin America	2180	2400	400	400	500	440	1300	1700
<u>World Total</u>	38370	43380	6240	6340	8430	8230	35930	36800
	<u>C A P A C I T Y</u>							
<u>Developed Countries</u>								
North America	16800	16800	2220	2120	3440	3460	20290	17250
Western Europe	19300	16600	1880	1700	2960	3040	17190	14400
Eastern Europe	5400	6450	920	800	2860	3500	4640	4900
Japan	6900	6850	870	850	1500	1510	6240	4360
Others	850	1250	20	30	140	230	600	630
<u>Developing Countries</u>								
Africa + Middle East	350	600	150	150	50	50	510	680
Asia	3550	4100	1300	1370	390	450	2190	2570
Latin America	2300	2900	350	390	520	520	2240	2740
<u>World Total</u>	55450	55550	7710	7380	11860	12760	53900	47530

Table 2. Capacity Reductions in the United States, Western Europe and Japan 1980 - 1983 ¹⁾

	<u>Plant Closures</u>		<u>Plant Idling</u>
	<u>'000 tpa</u>	<u>% of total capacity</u>	<u>'000 tpa</u>
<u>ETHYLENE</u>			
United States	1700	10	3800
Western Europe	3570	21	250
Japan	<u>2250¹⁾</u>	36	<u>520</u>
TOTAL	7520		4570
<u>PVC</u>			
United States	200	6	500 ²⁾
Western Europe	860	14	
Japan	<u>490¹⁾</u>	24	
TOTAL	1550		
<u>LDPE</u>			
United States	830	21	
Western Europe	1820	27	
Japan	<u>270¹⁾</u>	27	
TOTAL	2920		

1) The plant closure figures for Japan include the planned closures up to August 1985.

2) postponed

Table 3. Deferred or suspended petrochemical plant construction in developing countries
1000 tpa

COUNTRIES (Causes)	ETHYL- ENE	PROPYL- ENE	BEN- ZENE	METH- ANOL	STY- RENE	VCM	DMT TPA	PVC	HDPE	LDPE	PP	PS	OTHER
LIBYA (A)										55			
INDONESIA (B)	350	-	375			240	225	72	70 70	215 100		68	71 EG 148 Xylene
PHILIPPINES (A)	225									55	60		
ALGERIA (B, D)	500	200			200								Others
KUWAIT (C)	350		280		339								135 EG 147 Xylene
QATAR (C)									70				
U.A.E. (C)	150												Others
MEXICO ¹⁾ (B)	500			825		300							

1) Laguna del Ostion, 19 Plants postponed (1988)

CAUSES: A - Debt

B - Declining Oil Sales/Prices

C - Feedstock

D - Long-term Arrangements

THERMOPLASTICS WORLD DEMAND

Fig. 1

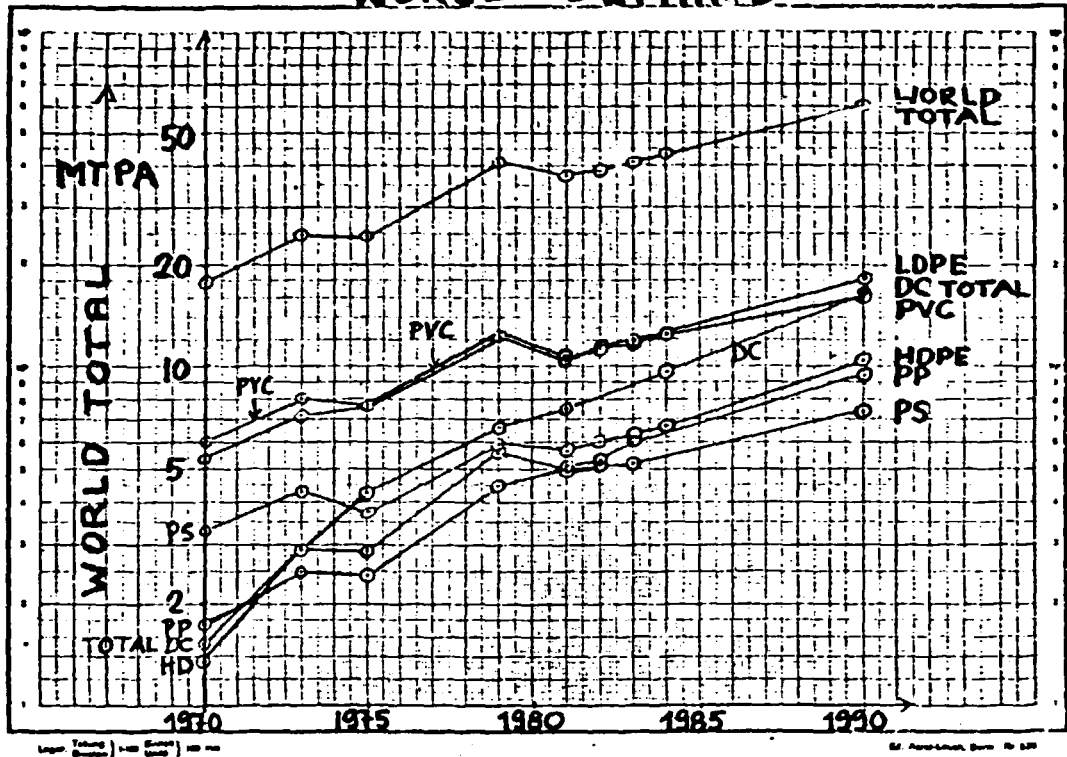


Fig. 2

ETHYLENE DEMAND

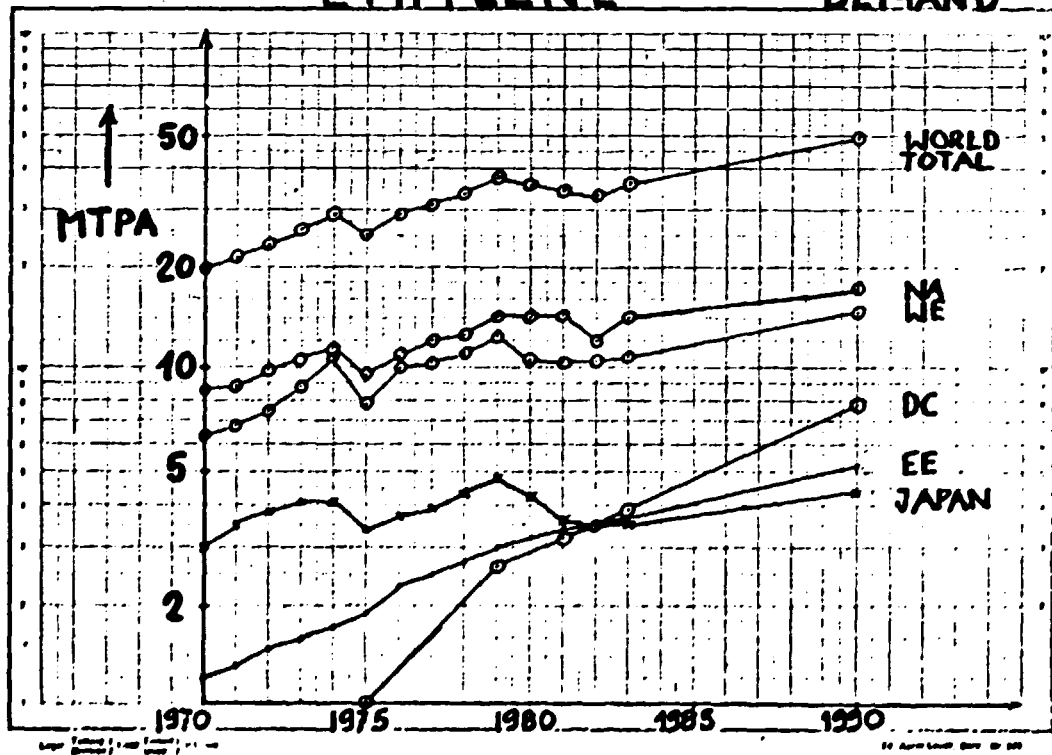


Fig. 3

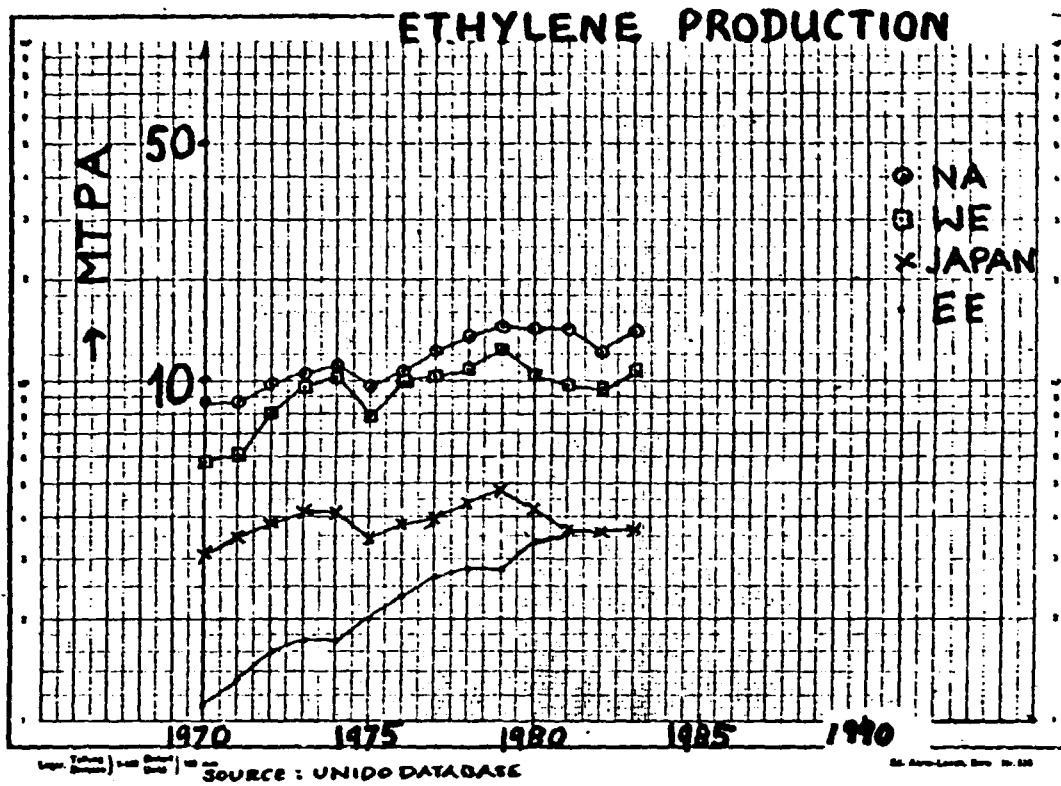
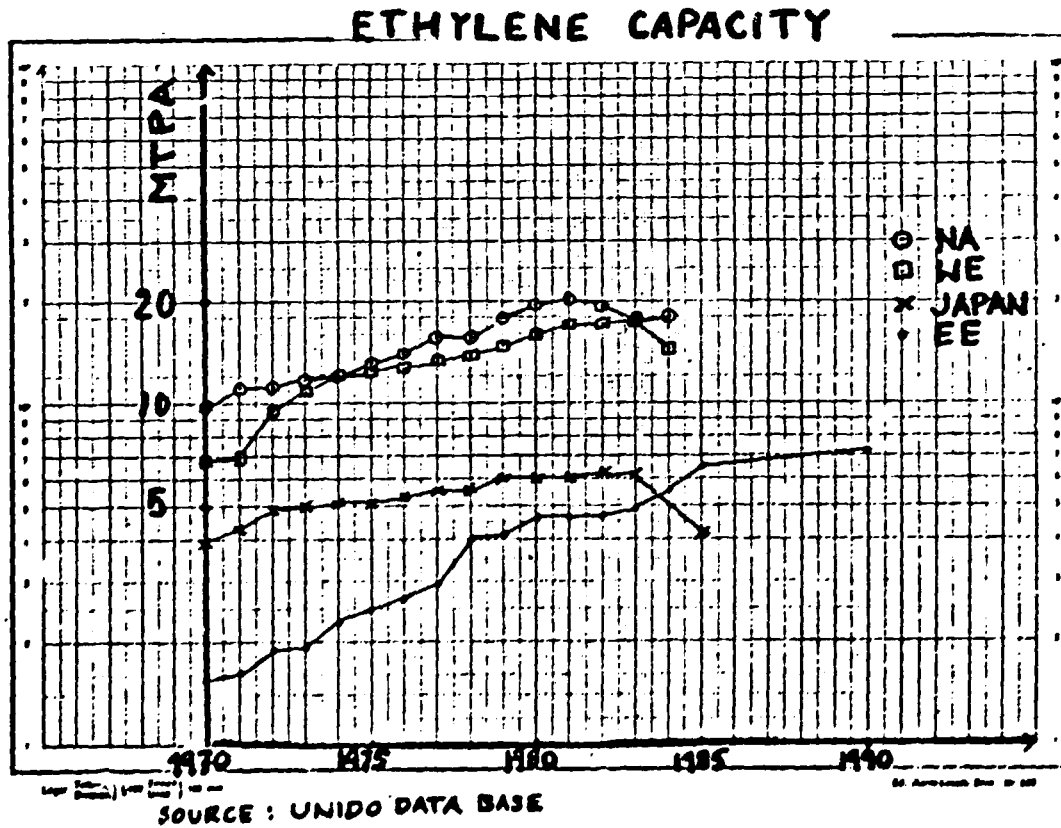


Fig. 4



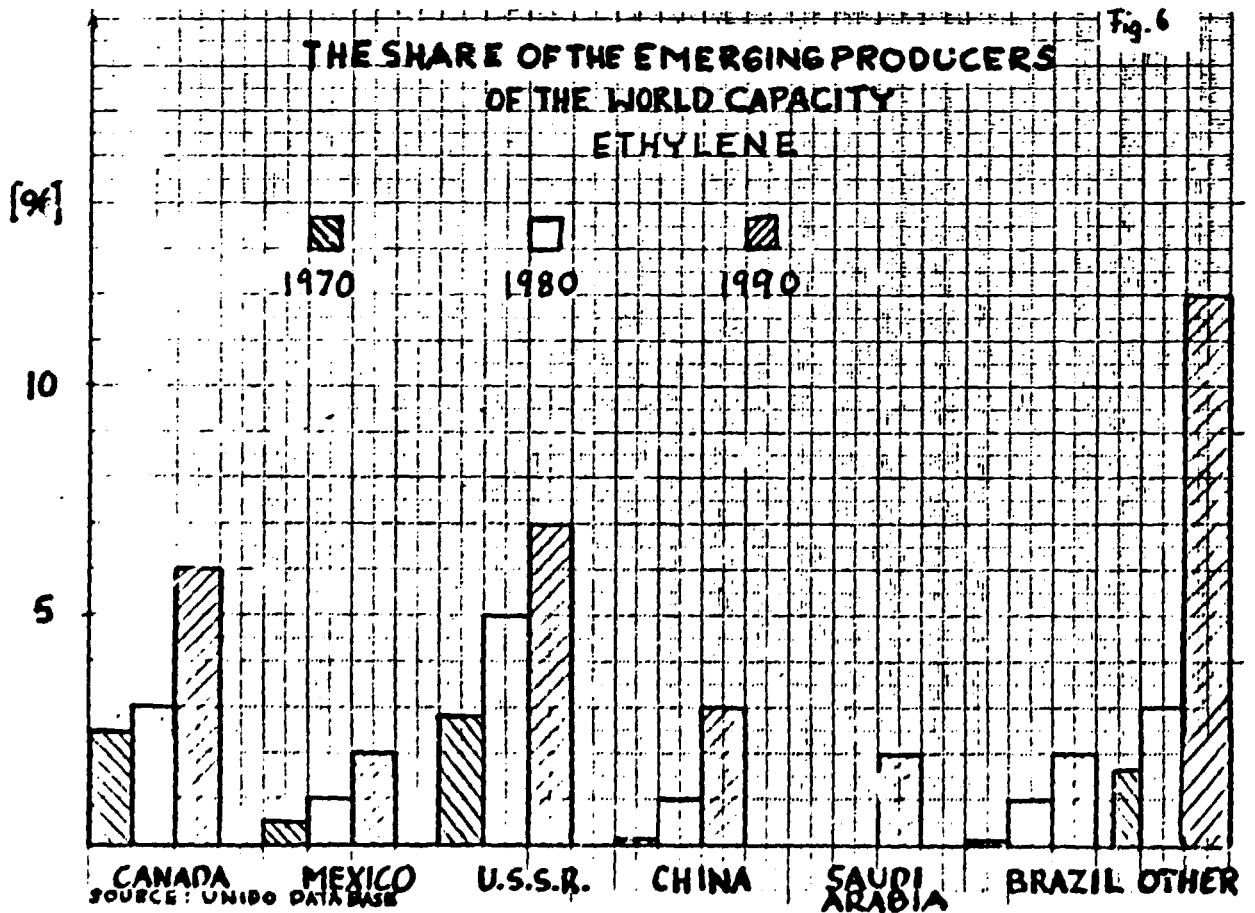
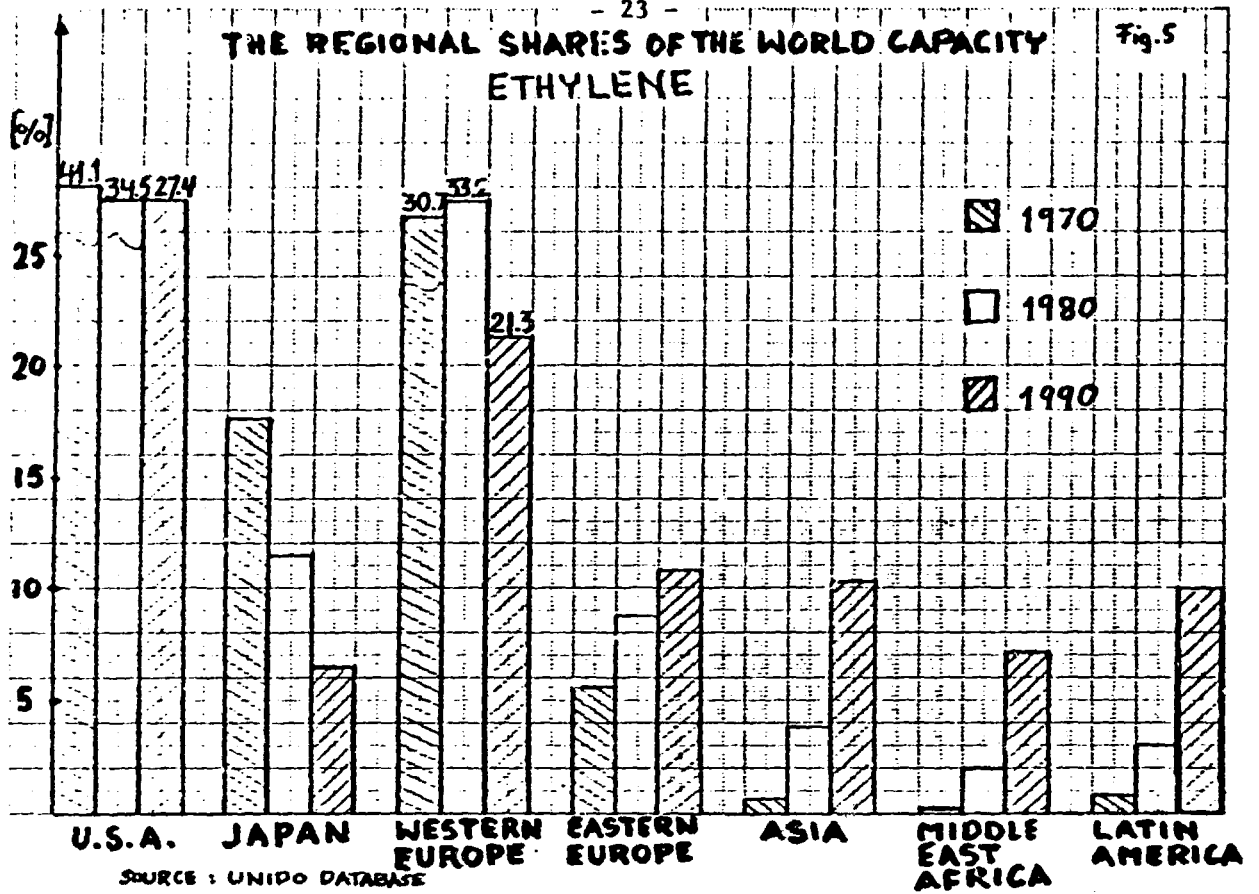


Fig. 7

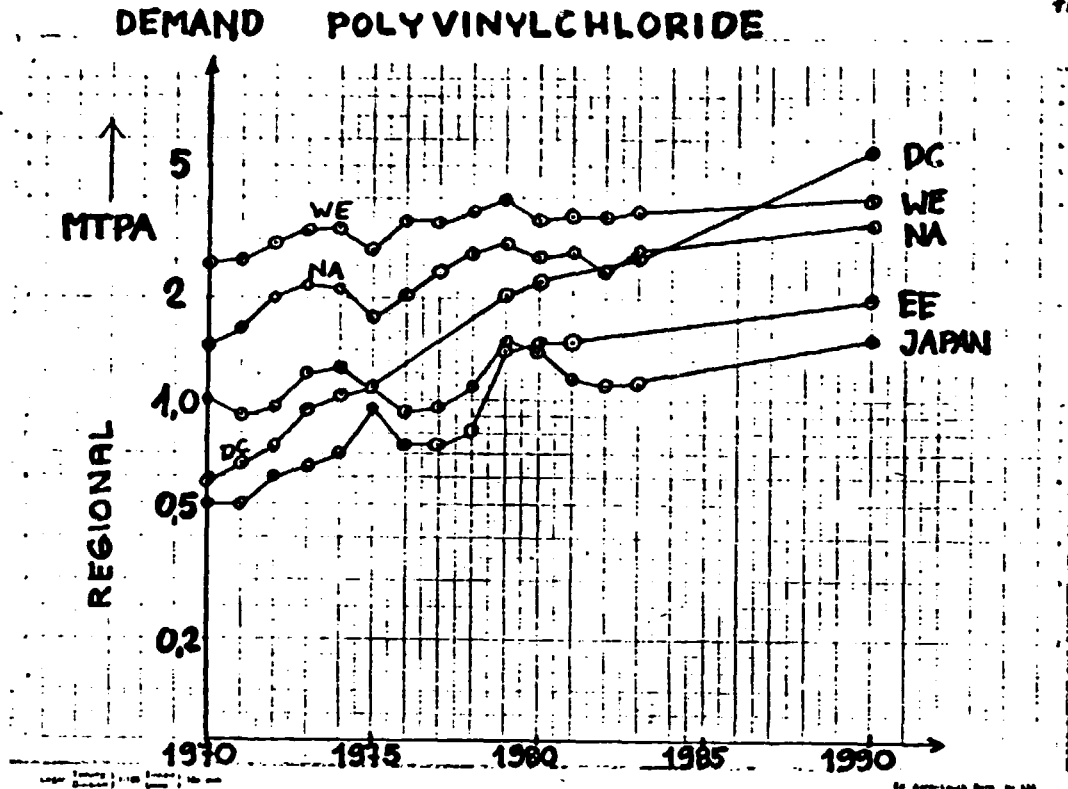


Fig. 8

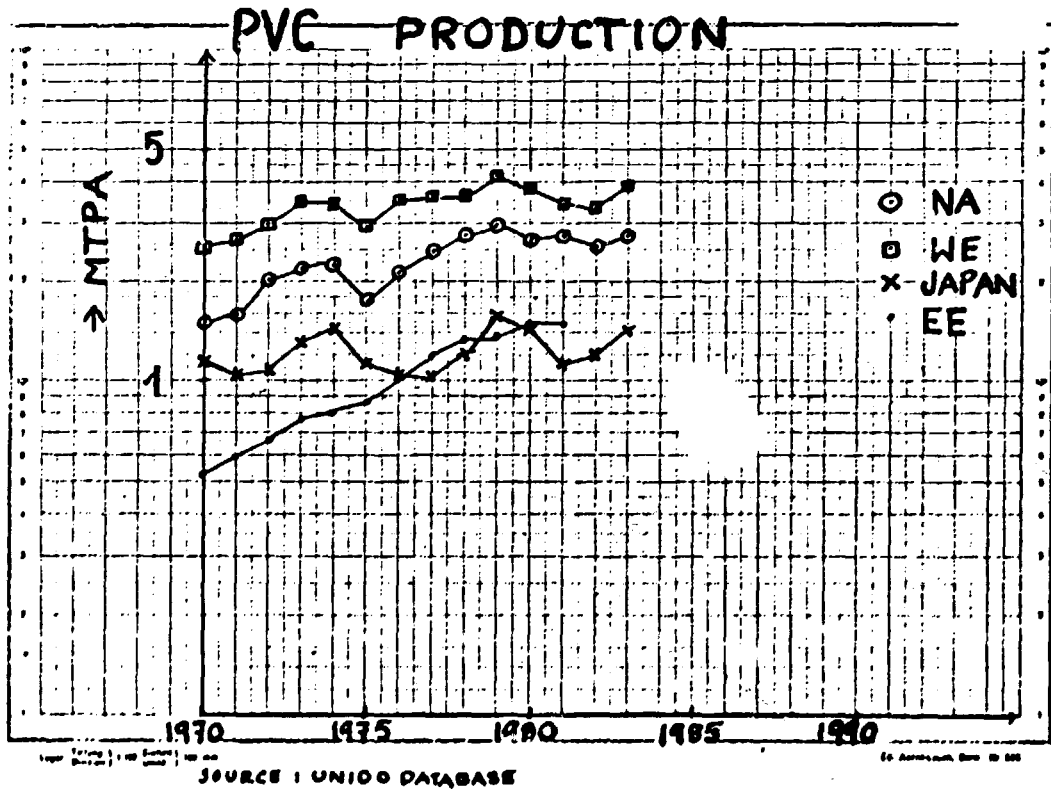


Fig. 9

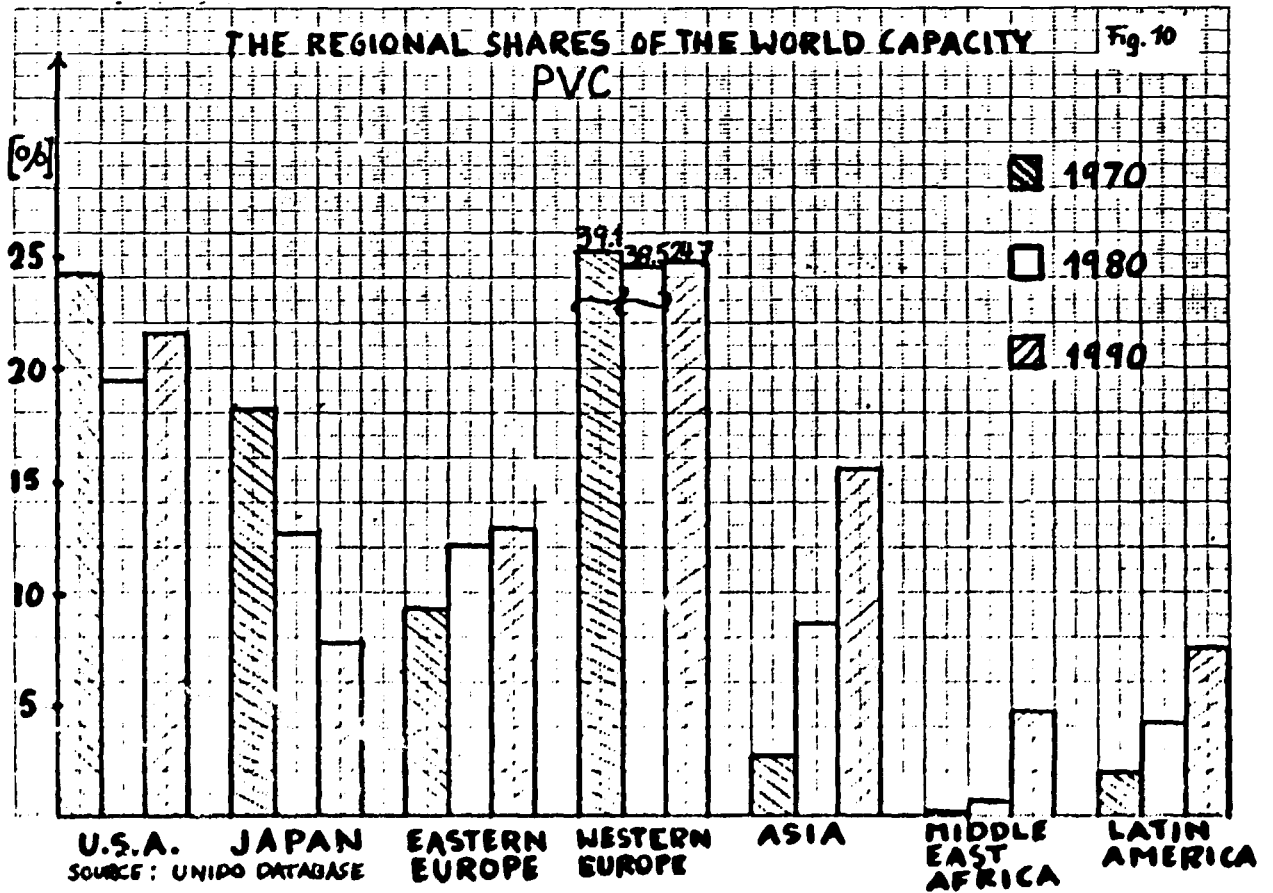
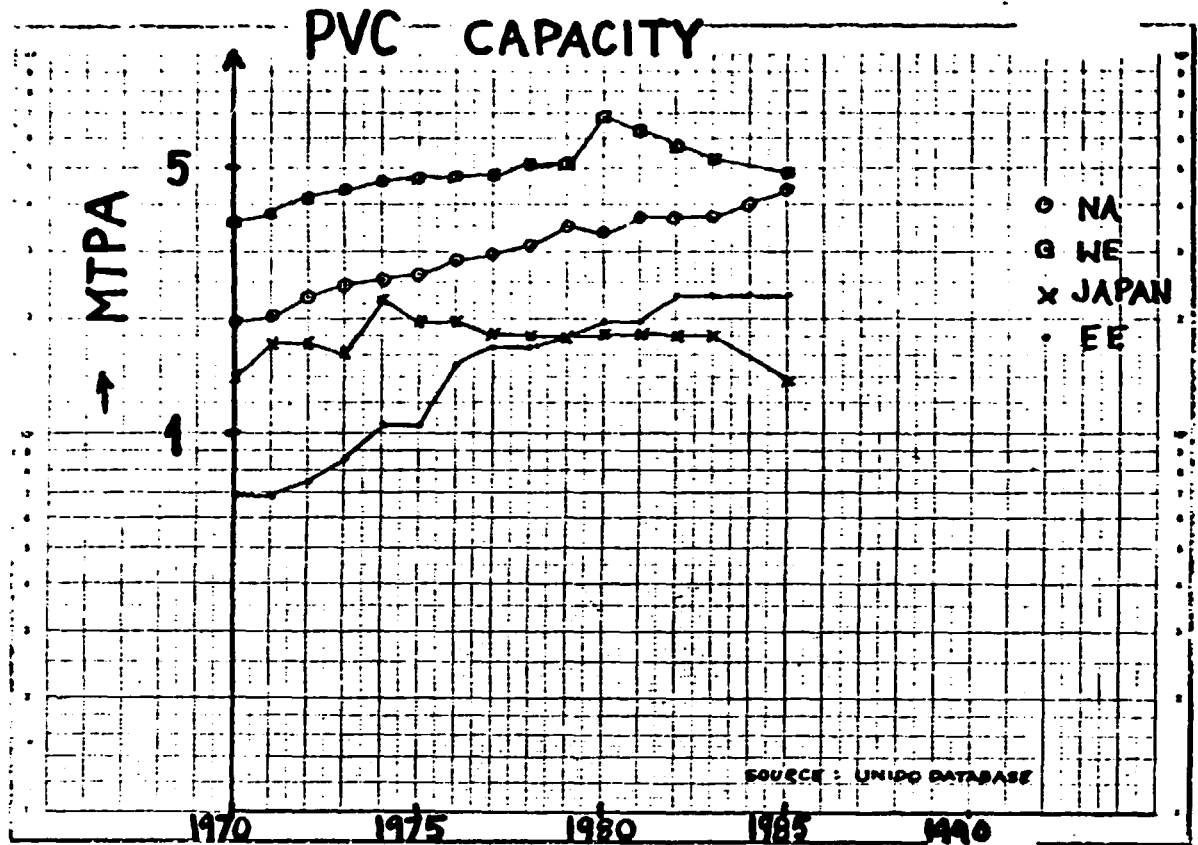


Fig. 11

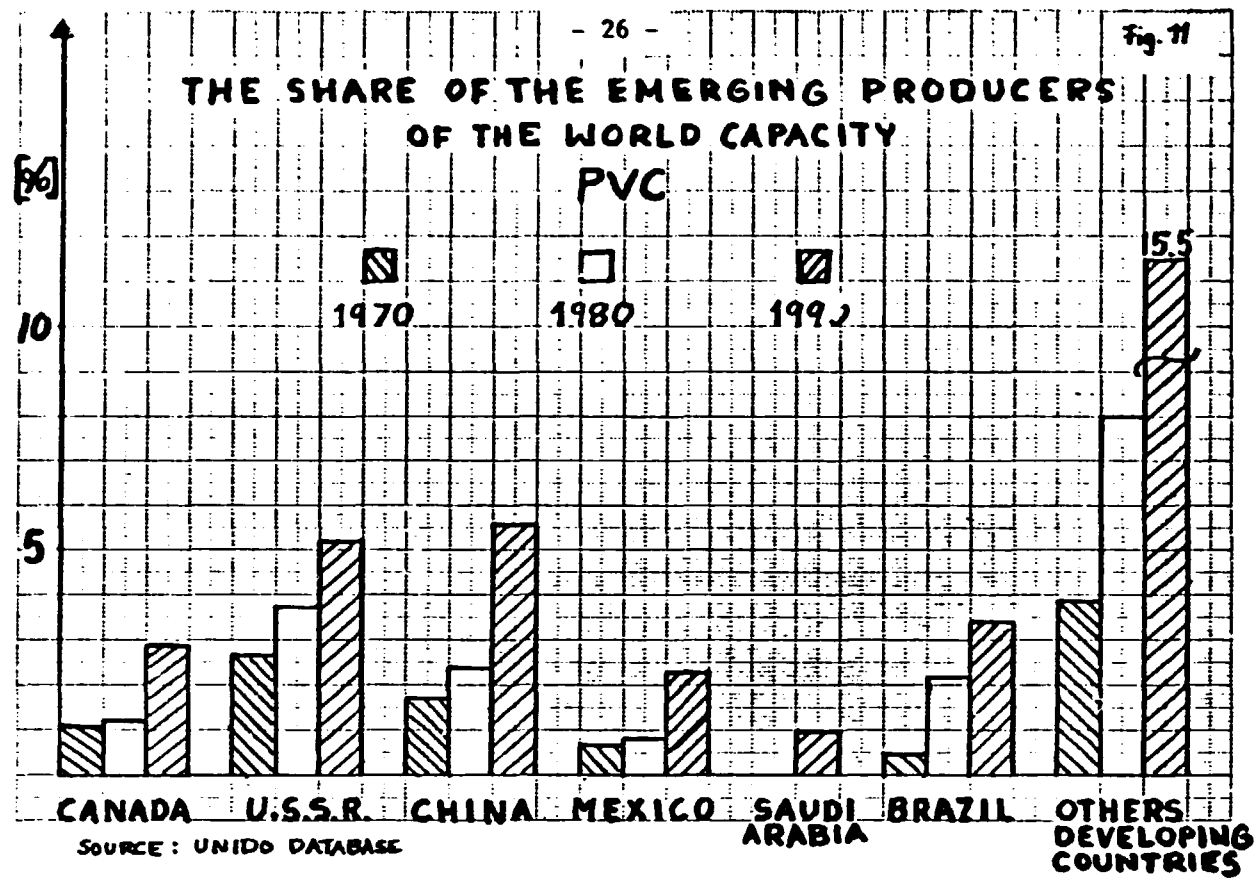


Fig. 12

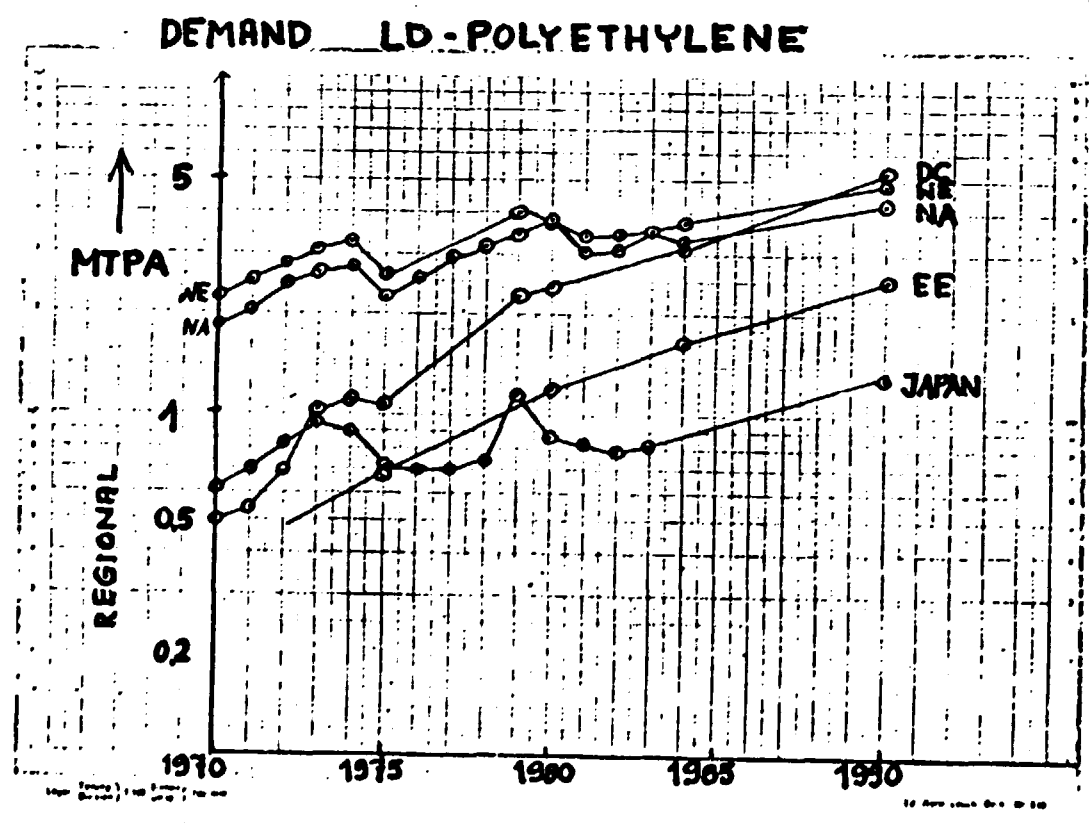
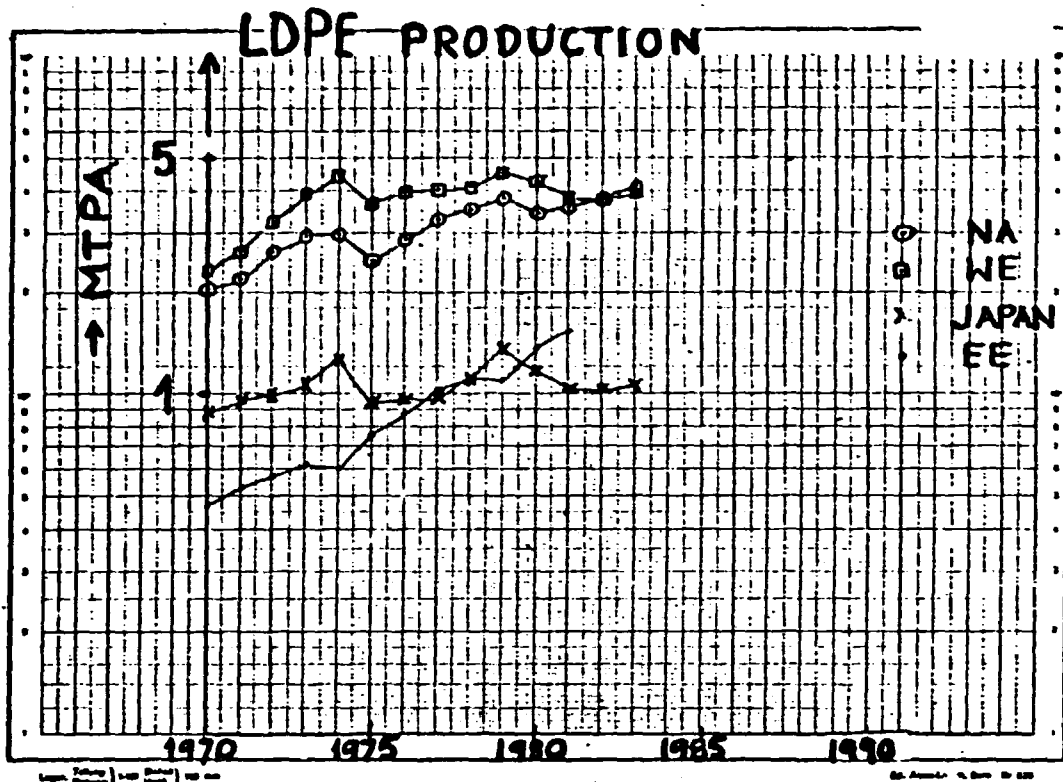
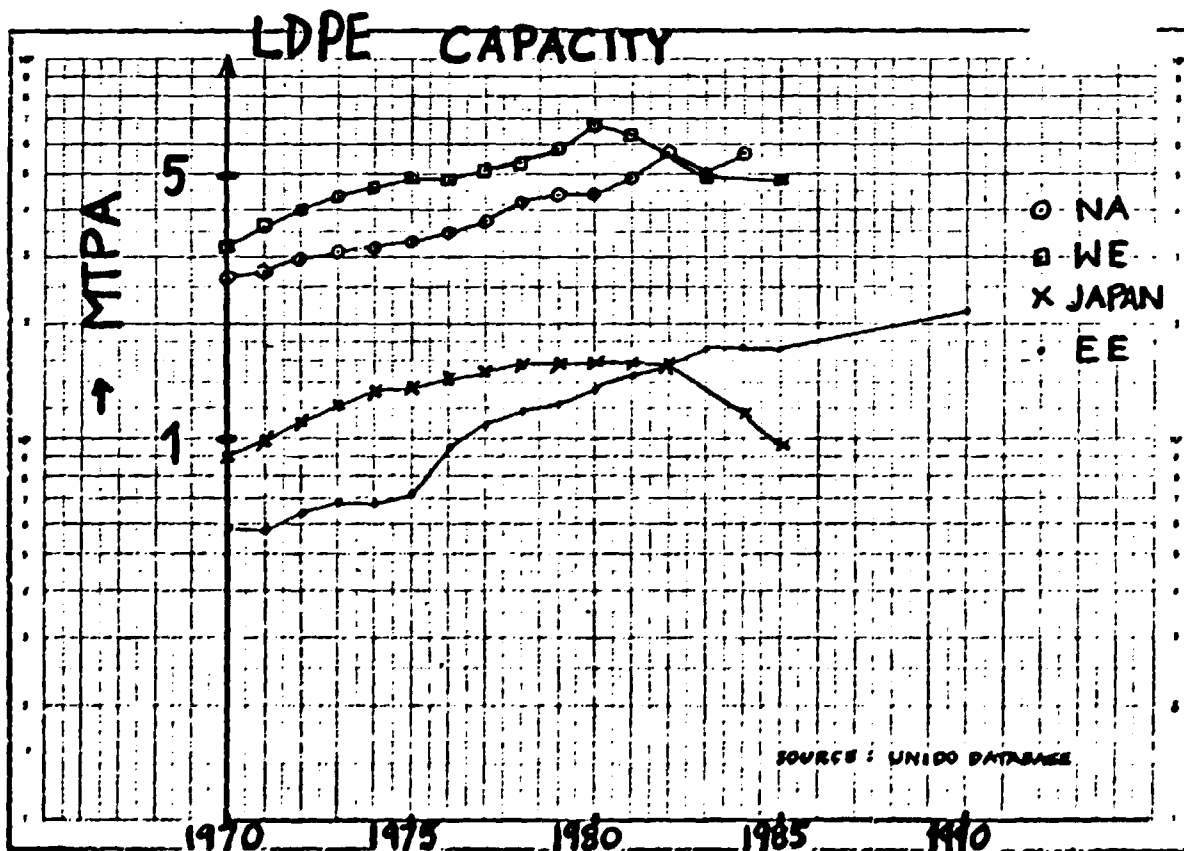


Fig. 13



SOURCE : UNIDO DATABASE

Fig. 14



SOURCE : UNIDO DATABASE

