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

D00490

ID

Distribution
LIMITED

ID/WG.34/88
20 October 1969

United Nations Industrial Development Organization

ORIGINAL: ENGLISH

Interregional Petrochemical Symposium on the Development of the Petrochemical Industries in Developing Countries

PET.SYMP. A/34

Baku, USSR, 20 - 31 October 1969

DEVELOPMENT OF THE PETROCHEMICAL INDUSTRY IN NIGERIA[1]

by

S. A. Kufeji
Nigeria

[1] The views and opinions expressed in this paper are those of the author and do not necessarily reflect the views of the secretariat of UNIDO. This document has been reproduced without formal editing.

Summary

1. No petrochemical complex has been established in Nigeria, but feasibility reports on its establishment have been submitted and are being studied by the Government.

2. Aspects of the complex include: polyvinylchloride (PVC), polyethylene, LNG, LPG, caustic soda, calcium carbide and fertilizer industries.

3. PVC is imported primarily for plastic shoes production; it showed a phenomenal import growth rate of about 66 per cent by weight between 1962 and 1965.

4. Polyethylene statistics are scanty. However, available figures showed a growth rate of 70 per cent and 40 per cent in 1964/1965 for low and high density resins respectively.

5. Statistics on calcium carbide, used as soil stabilizer and for generating acetylene for miscellaneous purposes, show fluctuation from year to year and therefore permit no growth rate estimation. A shrewd guess of 15 per cent growth rate is possible on local condition considerations.

6. Textile industry apart, 90 per cent of imported caustic soda is used in soap industries; future possible outlets are in the manufacture of hypochlorides, paper pulp and in glass industries.

7. Nigerian crude oil are uniquely low in sulphur; products like fuel oil are therefore essential in countries with stringent atmospheric pollution laws.

8. 94 per cent of associated gas produced in Nigeria is flared, while only 6 per cent is utilized for power generation and as fuels. Consequently, gas wells discovered are always shut-in.

9. Nigerian soil is generally high in acidity, deficient in sulphur and nutrients, and hence low in yield. Government which is the greatest purchaser of fertilizers heavily subsidises their sales in order to break through the sceptical attitudes of farmers to the use of fertilizers. Three types of phosphates and nitrogeneous fertilizers are sold.

10. LPG is at present imported, and there is no local utilization of it, the recognised greatest user of natural gas resources.

11. A growth rate of 20 to 25 per cent in the use of fertilizers is predicted and export possibilities to neighbouring countries exist. Urea industry is to be export-oriented.

12. After 1972, it will be necessary to either build a new refinery or expand appreciably the present refinery capacity of 42,000 BPD to satisfy local market demand.

13. Economic association is advisable if establishment of industries is to be feasible and rapid. The much talked about West Africa Association could be used as a spring-board.

14. It is imperative to train Nigerians for the proposed industries to curtail the use of expensive foreign staff.

15. Pioneer status, frequent review of import duty reliefs, tariff protection on raw materials etc., are some deliberate incentives offered by the Government to create an attractive investment climate.

16. Capital necessary for the establishment of petrochemical industries are necessarily high. Long-term low-interest credits are therefore essential and desirable.

1. Preamble

There is at present time no petrochemical complex in Nigeria. The objective of this paper is therefore oriented to pointing out:

(i) the extent of the abundance of resources available locally from which chemicals, fertilizers, pharmaceuticals etc. are traditionally derived;

(ii) the future prospects, Government incentives and concessions geared towards achieving the establishment of such petrochemical industry;

(iii) problems encountered and areas in which assistance is required with particular emphasis on the nature of the assistance.

1.1 Available resources

Nigeria is well ahead [illegible] countries in Africa, South of Sahara, in the production of crude oil which was at a time at a rate of 428,170 BPD. The present drop in production is unrepresentative as it has resulted from the present national crisis. It however, ranks as the third largest producer in Africa and the tenth in the world. There is every indication, judging from the present level of activities, that production may double before long. Tables 1.1 and 1.2 show the history of crude oil and natural gas production since 1958.

Crude oils produced in Nigeria have a variety of desirable properties the summary of which are shown in table 1.3. A typical crude oil assay is shown in table 1.2. In all these analyses one could see too clearly that Nigerian crude oils are uniquely low in sulphur content, a property which makes them and products, like fuel oil, derived from them, readily accep[table] [illegible] world [illegible].

[illegible] per cent of the crude oil produced at normal times in the local [illegible] is refined for products consumed locally. The remaining [illegible] per cent is exported. At the moment, the local refinery is non-operational, hence all the crude oil produced is exported.

[illegible] associated gas is [illegible] produced along with the crude oils. Table 1.2 [illegible] the rate of associated gas production since 1958. Table 1.5 [illegible] properties of the associated gas from typical fields. Only [illegible] per cent [illegible] utilized for various purposes but mainly for power generation [illegible] the [illegible] industries near the oil fields. The remaining [illegible]4 per cent of the produced gas is currently being flared.

In addition to the associated gases produced, there are however, many other gas fields discovered during the normal course of oil exploration. These gas wells are shut-in since there is yet no reason for their production.

In addition to the availability of natural gas as raw material, Nigeria is particularly fortunate in possessing many of the other mineral resources used as basic raw materials by the chemical industry. These include coal, lignite limestone, lead, etc. Granted that these alone do not guarantee the successful development of chemical industries to utilize them, the availability of these raw materials nevertheless provide a basis for their establishement and subsequent progressive expansion.

Table 1.1

Crude oil production, consumption, and exportation 1964-1968

Year	Oil produced (bbls)	Oil consumed (consumption/ locally	production	Oil exported
1964	43,[illegible],[illegible]	-	-	[illegible],[illegible],563
1965	[illegible],353,234	1,230,[illegible]32	1.[illegible]	[illegible],[illegible]4,[illegible]75
1966	152,42[illegible],16[illegible]	11,[illegible]2[illegible],271	7.[illegible]	[illegible]39,94[illegible],[illegible]4[illegible]
1967	116,[illegible]53,292*	5,[illegible]42,[illegible]1[illegible]	5.[illegible]2	[illegible],[illegible]7[illegible],[illegible]24[illegible]
1968	[illegible]51,[illegible]07,302*	-	-	[illegible]2,[illegible]47,[illegible]47[illegible]

*) production is unrepresentative; this as resulted from the present national crisis.

Table 1.2

Nigerian crude oil assay

Crude	API gravity		35.6
	Pour point	°C	- 5
	Sulphur	%	0.12
LPG	Yield	%	[illegible].0
Light naphtha	Yield	%	12.0
	Octane		[illegible]6
	Paraffin	%	60
Heavy naphtha	Yield	%	14.0

Table 1.2 (cont'd)

Nigerian Crude Oil Assay

Naphthene	Yield	%	49
Aromatics	Yield	%	14
Smoke point			20
Gas oil	Yield	%	18
	Cetane		48
	Pour point	°C	- 20
Heavy gas oil	Yield	%	5.0
Residual oil	Yield	%	35.0
	Sulphur	%	0.4
	Carbon residue	%	3.0
	Pour point	°C	+ 30
	Vanadium PPM		1
	Nickel PPM		17

Table 1.3

Aggregates of specifications of crude oils avalable

from various fields

Description	Test method	Range of specification available
Water content % by vol.		0.0 - 5.0
[illegible] 60/60°F		0.74 - 0.97
[illegible] 60°API		11 - 60
[illegible] Kinematic cS	11°API	5,000 - 50,000 cS
	60°API	1.0 - 9.4
[illegible] °C	ASTM D97-57	below-45 to + 40
[illegible] 60°C		below-21 to + 45
[illegible] wt	ASTM D1551-57T	0.04 - 0.5
[illegible] wt		0.1 - 0.7
[illegible] wt	IP 13/57	0.04 - 0.5
[illegible] wt		0.6 - 7.0
[illegible] wt		0.001 - 0.01

Table 1.3 (cont'd)

Properties	Test method	Range of specification available
ASTM distillation range	IP 24/55	
IBP recovery at °C		30 - 120
10% " " °C		60 - 234
20% " " °C		80 - 270
30% " " °C		100 - 290
40% " " °C		above 120
50% " " °C		" 140
60% " " °C		" 160
70% " " °C		" 194
80% " " °C		" 230
90% " " °C		" 286
Recovery at 300°C % by vol.		23 - 96
residue		4 - 72

Table 1.4

Natural gas production and consumption 1964-1968

Year	Gas produced (MCF)	Gas consumed (MCF)	% consumption/ production	Gas vented (MCF)
1964	36,332,962	1,883,447	5.19	34,448,516
1965	79,437,852	3,445,054	4.34	75,992,798
1966	102,852,751	6,233,392	6.07	96,620,359
1967	83,125,730*	5,540,567	5.96	87,465,163
168	51,028,085*	5,188,534	10.05	45,839,551

*) Productions are unrepresentative; this has resulted from the present national crisis.

Table 1.5

Analyses of associated gas
(Mole %)

N_2	0.5	0.7
CO_2	3.7	0.2
C_1	83.7	76.0
C_2	1.3	15.0
C_3	3.8	5.7
ic_4	2.8	0.5
nc_4	2.3	1.1
others	2.5	0.8
	100.0	100.0
specific gravity with respect to air	0.760	0.730
heat of combustion gross BTU/SCF	1,230	1,270

2. Projects

Many studies have been carried out and some are currently in progress either on Government initiative or in accordance with general understanding with Government by private firms on the techno-economic evaluation and feasibility of establishing a petrochemical complex and fertilizer industry in Nigeria. Reports of preliminary surveys, detailed feasibility studies, concrete proposals and recommendations have been submitted. Government is currently studying these reports which include proposals and recommendations that have been submitted on various aspects of a petrochemical complex namely: polyvinylchloride (PVC), polyethylene, LNG, LPG, caustic soda, calcium carbide and fertilizer industries. These products have been chosen on the basis of general review of the local chemical industry.

Local demand for most of the basic chemical products is small and plant capacities based mainly on the internal market are in general, considered uneconomic. This has been the main inhibition to development and establishment of a petrochemical complex.

Detailed information on the demand trend of these important products are given below.

2.1 Polyvinyl chloride (PVC)

PVC is imported into Nigeria in the form of pure resin, compound resin, semi-finished products and finished products. Available statistics in table 2.1 show that there is a phenomenal growth rate between 1962 and 1968 of about 60 per cent by weight import of PVC. Resins account for up to 70 per cent of the plastic resins imports.

In Nigeria, polyvinyl chloride is imported mainly formoulding into cheap plastic shoes with seasonal demand,

Table 2.1

Imports of PVC compound resins and total artificial resins into Nigeria 1962 - 1968

Year	Total artificial resins import (tons)	PVC compound (tons)
1962	2,440	1,200
1963	3,360	2,000
1964	3,300	2,200
1965	5,100	3,000
1966	7,800	4,000
1967	6,700	4,900
1968	8,500	5,500

for extended vinyl tiles, PVC pipes, wire and cable insulations, coated and impregnated fabrics, calendared sheets and films. Prospects are bright of a substantial growth rate which the Nigerian economy is capable of sustaining.

Pure resin is imported at a price of about £130 per ton c.i.f. while there is a 33.33 per cent import duty on it.

2.2 Polyethylene

Available statistics on this product are scanty. A growth rate, between 1964/1965, was 70 per cent for the low-density resin, 40 per cent for the high-

density resin and 50 per cent for the total.

Low-density resin is used for the manufacturing of films and sheeting while the high-density resin is used for moulding. Some articles are however, moulded on a mixture of high- and low-density resins.

Table 2.2 shows the imports of the two categories of the resins.

Table 2.2

Imports of polyethylene into Nigeria separately showing the low-density and high-density polyethylene 1963-1968

(tons)

Year	Low density	High density	total
1963	250	100	350
1964	600	500	1,100
1965	1,000	700	1,700
1966	1,500	800	2,300
1967	1,700	800	2,500
1968	1,850	950	2,800

It is believed that in particular, the consumption rate of low-density polyethylene resin in Nigeria shown in recent years can be sustained.

[illegible]

Table 2.3 shows the statistics of calcium carbide imported into Nigeria. The statistics do not permit of the determination of the growth rate. Calcium carbide is used in Nigeria as a soil stabilizer, to generate acetylene [illegible], miners' lamps, hunting and mining.

On the basis of the various local conditions taken into consideration, an annual growth rate of 15 per cent seems most likely.

Table 2.3

Imports of calcium carbide into Nigeria 1962 - 1968

Year	Calcium carbide
1962	2,300 tons
1963	1,120 tons
1964	2,000 tons
1965	1,800 tons
1966	1,180 tons
1967	1,600 tons
1968	1,400 tons

2.4 Caustic soda

Table 2.4 shows the statistics of caustic soda imported into Nigeria since 1962.

Table 2.4

Imports of caustic soda into Nigeria 1962 - 1968

Year	Caustic soda
1962	6,400 tons
1963	7,000 tons
1964	9,000 tons
1965	8,900 tons
1966	10,000 tons
1967	12,000 tons
1968	13,000 tons

The major industrial consumers of caustic soda are the soap industry where it is used as one of the vital raw materials and the textile industry to pretreat cotton fabrics prior to bleaching and printing. Soap manufacturing industries consume over 90 per cent of the caustic soda imported into Nigeria usually in flaked and solid forms.

The import duty on caustic soda is £3 per cwt or £60 per ton. The average c.i.f., price of the chemical is between £35 and £45 per ton depending on the

[illegible] and source of import.

The use of caustic soda may in future be diversified to include the manufacture of cotton fabrics to give them rich lustre, for the preparation of hypochlorite for bleaching cotton, for paper pulp and in the baking industries. Its growth rate is about 5% per annum to [illegible] in the next ten years.

[illegible] and LNG

[illegible] shows the statistics of the demand for LPG locally since 1965 until [illegible] was put out of operation as a result of the present situation in the country, the local demand was met from the local refinery between 1966 and [illegible]. Imports were suspended before the local refinery was commissioned after it was destroyed during the war.

[illegible] natural gas [illegible] that are derived for generation of [illegible] industries and power stations through gathering lines. The use of LNG [illegible] not been introduced in Nigeria.

[illegible] of LNG is recognized as the most substantial potential for natural [illegible]. Natural gas produced with crude oil in excess of the small amount used as [illegible] is presently flared.

Table 2.5

Imports of LPG into Nigeria and refinery offtakes 1965-1968

Year	Imports	Refinery offtakes
1965	5,345 tons	-
[illegible]	5,003 tons	786 tons
1967	3,474 tons	1,812 tons
1968	5,624 tons	-

[illegible] Fertilizer industry

Nigeria is predominantly an agricultural country. The variety of crops is immense. Tree crops like cocoa, rubber and oil palm are grown in the southern part. Food crops like cassava, beans are grown in the southern belt. Cotton, [illegible], guinea, millet are grown in the central part. Groundnuts are the major crop from the northern part.

The soils vary generally, but on average, are high in acidity, deficient in phosphorus and nutrient. As a result they have low yield and productivity. There

is a predominance of small sized farms. Even agricultural techniques are far from being described as modern. There is now, however, a new approach, whereby Government establishes large-sized plantations, but these are relatively few at the moment. Farmers are [illegible] and increasingly link to them, hence the introduction of fertilizers is not readily accepted as the farmers are rarely keen on experimenting with them to increase productivity, this partly due to a natural conservatism of the sheer poverty. Government is, however, currently heavily subsidizing the price of fertilizers in the hope that farmers may eventually appreciate their usefulness.

There are, as a result of the different soil conditions, different categories of fertilizers imported into the country. These are mostly phosphatic fertilizers as well as nitrogenous fertilizers. There is, without any doubt, a market in Nigeria large enough to the establishment of local fertilizer industries.

2.6.1 Phosphate fertilizer

This is required mostly in the Northern states for cultivating groundnuts. Three types are being imported, namely single superphosphates, triple superphosphates and fortified superphosphates. Table 2 shows the import statistics of phosphatic fertilizers in Nigeria since 1976. An average growth rate of between 20 to 25 per cent is expected.

There are export possibilities to neighbouring African countries with similar soil conditions as those in the north. Although raw materials for the production of phosphate fertilizers are not available in the country, high quality phosphate rocks are nevertheless available in a neighbouring country while the ready availability of pure sulphur is in fact not a problem as it is readily available in the world market.

The establishment of a phosphatic fertilizer industry in the country is justified on the projected increase in demand for this category.

Table 2.6

Imports of phosphatic fertilizer into Nigeria 1962-1968

Year	Phosphatic fertilizer imports
1962	7,500 tons
1963	8,300 tons
1964	13,000 tons
1965	10,500 tons
1966	16,000 tons
1967	29,000 tons
1968	32,000 tons

2.3.2 Nitrogeneous fertilizers

Table 2.7 shows the historic import statistics from 1962. Most of the nitrogeneous fertilizers are imported in the form of ammonium sulphate. However, urea and compound fertilizers are also imported. Recommendations vary on the representative fertilizer which can be acceptable on the basis of the soil conditions all over the country. Some reports recommend ammonium sulphate with which most farmers are conversant, while others recommend urea which is universally acceptable and can therefore be exported.

Considering the possibility of an annual growth rate of between 25 to 30 per cent and ready availability of raw materials locally, it would appear that the establishment of such an industry either mainly to satisfy the local farms or for export is not only justified but over-due.

Table 2.7

Imports of nitrogeneous fertilizers into Nigeria 1962-1968

Year	Nitrogeneous fertilizers
1962	4,000 tons
1963	3,000 tons
1964	8,000 tons
1965	12,000 tons
1966	11,000 tons
1967	29,000 tons
1968	32,000 tons

3. Future prospects

Prospects of an ever expanding local market and the ever increasing sources of raw materials paint a rosy picture for the future. For example:

3.1 Refinery

Local demand is such that the existing refinery of capacity 42,000 BPD cannot cope after 1972. It will then either have to be expanded appreciably with new plants and units installed, or a new refinery will have to be located elsewhere. Table 3.1 shows the local demand and the variety of petroleum products. Where a new refinery is established there is a possibility of manufacturing products such as aviation gasoline, which will find a ready market particularly in the neighbouring countries since they are not produced in any of the refineries in West Africa which are only geared to producting the straight forward conventional products.

Table 3.1

Statistic of annual import and consumption of petroleum product grades for 1968

Products		Total imports	Total consumption
Liquified petroleum gases (tons)		5,900	5,750
Aviation spirit		2,330	2,100
Motor spirit:	(1) premium grade	40,350	38,300
	(2) regular grade	42,280	41,010
Dual purpose kerosene:			
	(1) household	44,780	34,410
	(2) aviation turbine	9,280	15,120
Automotive gas oil:			
	(1) gas oil	77,930	78,250
	(2) Diesel oil	9,980	5,570
Fuel oil:	(1) high pour	39,070	39,460
	(2) low pour	37,050	30,020
Lubricating oils		2,470	3,840
Greases (000lbs)		1,320	2,110
Petroleum jelly, waxes etc.(000lbs)		6,080	7,060
Bitumen and asphalt (tons)		12,040	21,440
Others		2,160	470

[illegible]

Note to table 3.1: The figures are given in thousands of imperial gallons unless otherwise stated.

. Petrochemical industries

[illegible] a petrochemical complex, either natural-gas based or refinery-offtake based, to produce polyvinyl chloride (PVC), low-density polyethylene (LDPE) and caustic soda is being contemplated. The complex will manufacture products at the following rates:

PVC	[illegible] tons/year
LDPE	25,[illegible] tons/year
Caustic soda	27,[illegible] tons/year

Such a unit will be feasible by 1974/1975 when the industry can be commissioned.

. LPG, LNG

Natural gas, raw material for this industry, is abundantly available. [illegible] per cent of the associated gas produced is flared while [illegible] wells have been shut-in. There is even a possibility of an increase [illegible] natural gas [illegible]. [illegible] market, [illegible] takes only small quantities. The establishment of LNG, LPG [illegible] be export-oriented.

. Fertilizers

. Phosphatic fertilizers

[illegible] earlier, the demand justifies even with [illegible] the establishment by 1971/1972 of a single superphosphate [illegible] capacity of [illegible] tons per year. Such a project [illegible] examined in detail and found to be feasible.

. Nitrogenous fertilizers

[illegible] either ammonium sulphate or urea [illegible] at the rate of 60,000 [illegible] per year [illegible]. [illegible] also exist for an export-oriented industry as the raw materials are in abundance if the production of [illegible] urea is embarked upon and a suitable world market can [illegible] for it.

4. Problems encountered

4.1 Re-grouping into larger economic units

With a population of about [illegible],000,000 the market in Nigeria is undoubtedly the largest in West Africa and one of the largest in Africa. However, the demand is not large enough to derive all the benefits of scale from the techno-economic point of view which is the main consideration in the establishment of a petrochemical industry.

It is therefore imperative that a form of economic association be formed to widen the market and improve the cost demand. West African Economic Co-operation perhaps one of the possibilities much talked about in this respect.

4.2 Unification of demand

Besides it will be necessary to concentrate on only one category of products and not attempt to produce the wide variety now imported. To achieve this objective, it will be important to manufacture a product which will be acceptable to the users of other varieties. This will involve some people in changing the technique to which they have been accustomed. For example, farmers who use ammonium sulphate, urea and calcium ammonium nitrate may all be made to use only one of these fertilizers thereby justifying the establishment of that particular product. If the deciding is urea, say, efforts will have to be made to re-educate those other farmers who have been used to ammonium sulphate or calcium ammonium nitrate in accepting to urea and in using it correctly and effectively

4.3 Transportation

Nigeria is far from those countries in the world where related products are consumed in appreciable quantities. As a result, the advantages of cheap and abundant raw materials are offset by unnecessarily high freight and other costs. By using supertankers however the freight element can be drastically reduced but unfortunately, the harbour facilities need to be greatly improved to enable such tankers to be used in our harbours. It is worthy of mention here that in spite of these limiting factors, however, results of detailed studies have shown that the export of LNG, LPG and liquid ethylene as basic chemical raw materials are still feasible projects.

4.4 External markets

In most cases where from techno-economic point of view a project is judged to be feasible, it is very difficult to find an external market for it. The de-

[illegible] study on urea production is a very valid case in point.

Equipment

[illegible] of the machinery required for the establishment of the industries [illegible] come from more developed countries like Europe and America. The freight [illegible] in most cases render such [illegible] competitive [illegible] the developed [illegible] world. [illegible] freight, the investments required in [illegible] developing country like Nigeria cannot [illegible] capital [illegible] borrow from [illegible] money [illegible] terms of repayment are [illegible].

[illegible] Personnel

[illegible] no petrochemical or fertilizer [illegible] very knowledgeable [illegible] in these [illegible] adequate local expertise [illegible] foreign experts are [illegible] of such industries. [illegible] prior to the [illegible].

[illegible]

[illegible] required is that which is connected with the establishment of [illegible] industries where investigations indicate that the pro[illegible] assistance is required in:

[illegible]

[illegible] properly equipped for preparing [illegible] skill to cope with whatever expertise [illegible].

[illegible] will necessarily have to be backed [illegible] courses [illegible] that have [illegible] technical know-[illegible].

[illegible]

[illegible] which will be feasible and attractive to be estab-

listed if the market were available for the resulting products. In this respect a guaranteed world market would be ideal. As an important first step, however, it is important for most of the countries in Africa to co-operate with one another and to group themselves into economic units with a view to increasing the demand for the particular products, the production of which will then benefit from the economic scale of production. Any assistance which can be provided in ensuring the achievement of these objectives will be beneficial to the establishment of a host of projects.

5.) Capital

Most petrochemical industries require such capital which developing countries cannot generate without resorting to borrowing. Financing in terms of long-term low-interest credits to purchase required parts is indeed a major assistance which Nigeria seriously requires.

6. Government policy and incentive

The primary objective of Government is directed towards a rapid economic development achievable through long-term growth and development of the country. The importance of rapid expansion and diversification of the industrial section of the economy cannot be over-emphasized. There is a deliberate programme to encourage the establishment of industries which will manufacture those products hitherto imported and there are additional incentives to those industries which in addition are export-oriented. Agro-allied industries, petrochemical and chemical industries are very high up in Government priority list of those industries.

The type of incentives Government normally grant those industries include pioneer status, assurance for frequent review of import duty reliefs, adequate tariff protection of desired raw materials, adequate import duty concession on the constructional capital goods, ability to obtain required foreign exchange, to name but a few.

On the basis of these incentives and conditions, the availability of essential raw materials, the already local market of any size which is sustainable by the economy, the investment expected in the petrochemical complex in the [illegible]

1. 2. 72