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Large Scale Industrial Projects in  
Regional Development Policies :

(A Case Study of the Brazilian Petrochemical Industry)

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Thesis presented for the Degree of  
Doctor of Philosophy (Business) at  
the School of Industrial and  
Business Studies of the University  
of Warwick

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## Proposed Industrial Units for the N E (Plastics)

PRODUCT	Technology	Investment US\$ M
PVC wiring and cables	High	30.0
Polyethylene Bags	Low	3.6
Plastics Medical Articles	Medium	6.6
Flexible laminates of PVC	Low	31.3
PVC sheeting and flooring	Low	4.9
HD—Polyethylene Furniture	Low	0.6
Domestic items for Polyethylene	Medium	1.5
Polyethylene & Polypropylene tubes & connections	Medium	0.5
Sheet and film made of PVC for packaging	Low	5.0
Agglomerated tanks & laminates of polyester	High	8.9
Grinding wheels, emery clothes, abrasives, brake linings & clutch discs	High	1.0
Phenolic & melamine laminates	Low	2.0
Flexible foams	High	2.5

Source: Petroquisa

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Abbreviations

BA	-- Bahia.
BID	-- Banco Interamericano de Desenvolvimento.
BNB	-- Banco do Nordeste do Brasil S/A.
CEPED	-- Centro de Pesquisa e Desenvolvimento da Bahia.
CIA	-- Complexo Industrial de Aratu.
COFIC	-- Comitê de Fomento à Industrialização de Camaçari.
COMCOP	-- Comissão Coordenadora do Complexo Petroquímico de Camaçari.
CONDER	-- Companhia de Desenvolvimento do Recôncavo.
COPEC	-- Complexo Petroquímico de Camaçari.
DNOCS	-- Departamento Nacional de Obras Contra as Secas.
ETFBA	-- Escola Técnica Federal da Bahia.
FGV	-- Fundação Getúlio Vargas
FIBGE	-- Fundação Instituto Brasileiro de Geografia e Estatística.
FIESP/CIESP	-- Federação e Centro das Indústrias do Estado de São Paulo.
IBP	-- Instituto Brasileiro de Petróleo.
NE	-- North East Region.
NPP	-- North East Petrochemical Pole.
PROPAR	-- Promoções e Participações S/A.
RMS	-- Região Metropolitana de Salvador.
R & D	-- Research and Development.
SIC	-- Secretaria da Indústria e Comércio da Bahia.
SME	-- Secretaria de Minas e Energia da Bahia.
SETRABES	-- Secretaria do Trabalho e Bem Estar Social da Bahia.
SUDENE	-- Superintendência de Desenvolvimento do Nordeste.
UFBA	-- Universidade Federal da Bahia.

(Further details in section 4.4.5).

METHOD

There are two distinct parts of this work. The first one is the theoretical background which began with a course on "Corporate Planning" and "Business Policy" at the University of Warwick in 1977. The Second Part is the field research that was made in Brazil in discontinuous periods in 1977, 1978 and 1979. The first period was dedicated to the coverage of literature on topics relating to the subject, together with the development and regional development plans in Brazil, documents and papers about the petrochemical industry, legislation, new projects of industrial plants in this field and a visit to petrochemical companies in Brazil. There was an intensive collection of data from the Federal and State Government Departments, and companies about the subject. At one stage a questionnaire was produced and given to a small sample of companies. However, in the presence of other similar researches being made at the field by renowned institutes (SENAI, CEPED and afterwards NAI/PB and ABIQUIM), I decided to drop the questionnaire in favour of interviews (a guide is attached to this thesis.) These interviews were made specially in the last period when I travelled throughout Brazil, especially the North East region, interviewing local entrepreneurs and Government officials involved with the planning and management of petrochemical industries and its segments.

### SUMMARY

This thesis deals about the organization and planning of the petrochemical industries in Brazil with a special emphasis on the North East petrochemical 'pole' (see 2.2), an industrial project whose core industries are settled in the Municipality of Camacari.

That pole is the leading industrial development project in the region, headed by the government and having specific social and regional objectives. The thesis examines the policies adopted to attain those objectives and the progress made so far.

The effects of the pole on the whole region being very limited, the thesis makes an analysis of the changes which occurred at Camaçari after the implementation of the pole and relates those changes to the overall needs of the region.

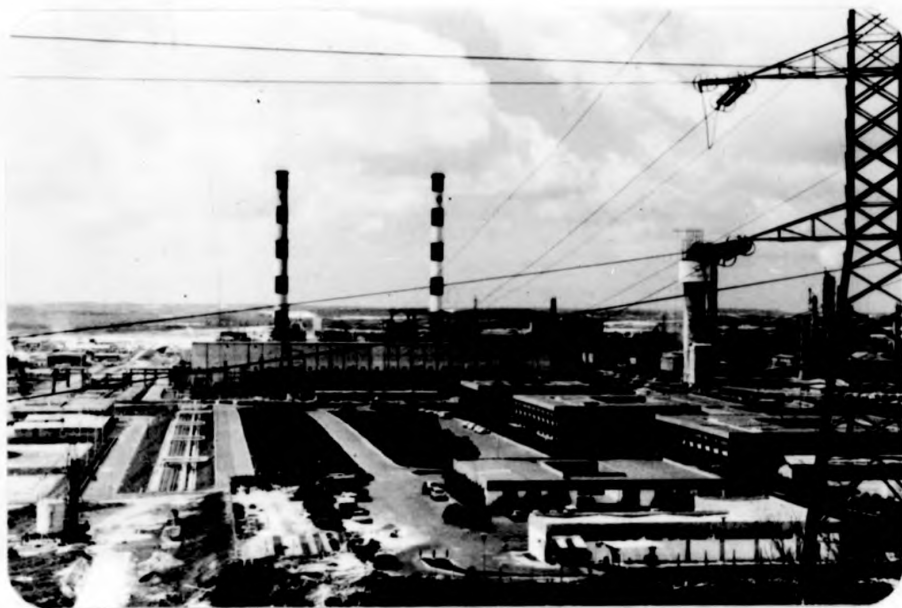
The main findings give a credit to the planning efforts in making a pole fully integrated with the use of regional feed-stocks, but point to failures in the policies designed to turn that pole into a catalyst of regional development. The policies adopted were more suited to create an industrial enclave, rather than develop an industrial pole.





Two views of the petrochemical industrial  
complex at Camaçari





Two views of the petrochemical industrial  
complex at Camaçari



## INTRODUCTION

## INTRODUCTION

This thesis is about the planning and organization of an industrial petrochemical pole located in the North East of Brazil with its core industries settled at the Municipality of Camaçari in the State of Bahia within that region (see diagram 1.4 and 1.6). Among the main objectives of that complex were the industrial decentralisation from the South East to other parts of Brazil, the provision of jobs for the North East area, regional development and the strengthening of the Brazilian private sector. (Pres. da Republica (1971) - Exposição de Motivos No. 2/3).

Following the extensive literature in this field (see Chapter Four), we assume that an implementation of an industrial pole is not sufficient to attain any of the above objectives. There are, however, some characteristics of the petrochemical industries (see Chapter Three) and peculiarities of the region that can turn such an industrial pole into a more effective tool for regional development.

For reasons stated throughout the work (Chapter Five), we have chosen to deal with human resource policies as one of the most important fields for a study of the impact of the pole on the region. These facts, then, have guided the two main lines of the research, that is, the characteristics of petrochemical industries and the effects of the human resource policies adopted by a pole built almost from scratch. We may sum up our thinking in two sets of propositions we will discuss throughout the next chapters:

(a) Propositions saying that the petrochemical industries do not favour explicitly the requirements of the regional development of the North East (NE):

a.1. The petrochemical industries favour a policy of intense concentration due to their technological characteristics. They are capital intensive, operating with a high interconnection

in respect of the individual units of production so that each must be geographically integrated with the other and using small amount of labour except at highly skilled levels (Chapter Three).

- a.2. The regional development of a vast region such as the NE cannot depend on the growth of an industrial complex built at a single point of its territory (Chapter Two).
  - a.3. The NE is a large and expanding supplier of low skilled labour, having high rates of unemployment, of migration from the hinterland and a fast pace of urbanisation, therefore a policy for the creation of decentralised labour intensive industrial units is theoretically more appropriate for its developments. In particular, we think that success in achieving regional objectives can be measured by the impact on the social structure of the region, by the provision of jobs, by the increase in the level of entrepreneurship, by the creation of new skills, knowledge and know-how, in summary, by the impact on the human resources structure.
- (b) Propositions saying that after the political decision to locate a petrochemical pole at Camaçari had been taken, proposals to link the pole to the regional needs can still be made by:
- b.1. The development of a broad linkage of industries all over the NE to consolidate and strengthen the industrial complex at Camaçari and taking advantage of the existing human resources in the area.
  - b.2. The creation of the right atmosphere for the development of those human resources; and here, policies favouring the initiative of new entrepreneurs are a vital step.

- b.3. A high level of cooperation between the private sector (national and foreign) and government as a secure way to guarantee adequate technology and regional participation.

The thesis examines progress made so far, the relationship between this progress and the regional needs, the effects of the industrial complex on the whole region and the human resource policies being pursued by the various levels of government and private institutions and organizations, to establish how far it will be possible to attain the objectives set out for regional development and whether new initiatives are now required to pull the development back on course. Camaçari is taken, then, as a thermometer of the human resource policies undertaken by the North East Petrochemical Pole (NPP).

Note that human resources here are taken in the broadest sense to cover the whole community beginning with the entrepreneur who will be needed to start up business and moving right through the population with a detailed study on the macro-structure of the pole itself (Chapter Four). This is, then, organised in six chapters, Regional Background, Industrial Planning in the NE, The Petrochemical Industry, Structure and Organization of the Pole, Human Resource Policies and the Local Community.

#### CHAPTER ONE

Our study begins with an analysis of the environment where the petrochemical industrial complex has been set up, with the solid objectives of defining the real problems facing that industrial project. An introduction to the Brazilian Regional problem is made and afterwards an analysis of the socio-economic variables that may influence the social policies of the pole. The analysis is made by breaking the region into its States, its major Metropolitan Areas and Municipalities from which we give special emphasis to the area that shelters the majority of the NPP industries, that is, the Municipality of Camaçari in the Great Metropolitan area of Salvador

(RMS), State of Bahia. This study is necessary to show the way in which the pole is related to the three levels of government in Brazil (Federal, State and Municipal). After all, the Government (especially the Federal Government) is the promoter of this industrialisation effort, besides being its main stakeholder. As the Federal Government intervention was directed to the regional development among other aims, it should adopt policies not only to increase the industrial output, but also to raise the standard of living, to promote employment, and provide a better distribution of income and related social benefits.

The conclusion of this first chapter points to important facts for the understanding of this thesis.

- (i) There are sufficient raw materials, including hydrocarbons to make the region a natural location of chemical industries.
- (ii) There is no strong linkage between the petrochemical industry and other major economic activities of the region which are traditionally based mainly on agriculture, which puts tied restrictions on the complementarities of its economic benefits and on its economic impact.
- (iii) The quality of the human resources of the region in terms of industrial skills is very low which may affect negatively the performance of the pole.
- (iv) While being served by the RMS (Metropolitan Area of Salvador) the pole will affect specially the local community of Camaçari where the main complex of heavy chemicals is located.

## CHAPTER TWO

After the knowledge of the environment in which the pole is settled, the first topic is an understanding of the reasoning behind the principal promoters of the policy. Chapter Two - "Industrial Planning in the North East" - puts us straight into this picture. We have made an analysis in

the evolution of regional industrial forms till arriving at the present stage which emphasises the implementation of growth pole in Perroux's sense (see 2.2). In effect, the data collected indicate that the petrochemical industry can well perform the task of a growth pole in general. They demonstrate the conditions of large size (and economic dominance), of a rate of growth faster than that of the economy in which it is embedded and a high degree of interlinkages with other sectors. This third characteristic, however, is not fully developed in the NE. At this stage, a list of the terms to be considered in this study is produced together with additional diagrams showing their linkages among all the firms in the pole, their main products and the principal applications of their output. We finish the chapter showing that:

- The new industrial plans have not yet reversed the unbalanced growth of Brazil, though they are playing an important role in the growth of the NE.
- The strength of the NE pole would lie in its ability to attend to the third condition set up for the consolidation of a growth pole: its local linkages.
- Being set in a low consumption market, in terms of both industrial and consumer-end goods, the present and future prospects for an increase in the down-stream economic linkages of the NPP (North East petrochemical pole) looks very gloomy. This is, however, a field where efforts should be concentrated for the final consolidation of the pole.

### CHAPTER THREE

Chapter Three shows how the nature of petrochemical industry poses some serious threats to the feasibility of attaining the social objectives of the NPP. A study is made of the evolution of petrochemical companies in the World and in Brazil to see how it could fit with the planning



requirements of the NE. Due to the large number of petrochemical products, the choice of a particular kind of product that would suit the requirements of regional development is more difficult than in most other manufacturing sectors. The selection, however, can be directed to those segments of the transformation industry based on petrochemical products which seem most appropriate to the job in hand.

These transformation industries even those presenting characteristics most suitable for the regional development, pose some problems for effective planning. These are the tendency to break up into miniscule units, the low income and low consumption of the local NE markets, the prices of the basic petrochemicals and the lack of experienced regional entrepreneurs . We conclude chapter three showing that:

- The characteristics of the petrochemical industry favour its organisation in the form of a pole.
- Its nature (capital-intensive sophisticated technology) is not in line with the social objectives of the pole, which gives reasons why the initial aims of the pole to help in the solution of the gross social problems of the region should be taken with caution.
- And priority should be given to the establishment of medium- and long-term policies for selected segments of the transformation industry based on petrochemical feedstocks.

#### CHAPTER FOUR

Having this background on the regional problem and on the characteristics of petrochemical industries, chapter four focuses on the organisation of the pole. Who's who there? What are the main functions of all the public and private bodies inside it? The aim is to verify if the pole as it is structured and managed has been an effective tool for the attainment

of the social and development goals of the region and also to analyse the macrostructure in which the corporate strategy of the sub-plan for the human resources is made. This study of the corporate strategy sets up the path for the next two chapters on the internal (chapter five) and external (chapter six) aspects of the human resources policies.

#### SKELETON OF NEXT CHAPTERS

In fact, all these preceding four chapters led us straight into one of the main subjects of this thesis. Actually, the Regional Background, the Industrial Planning for the NE, the Petrochemical Industry and the Structure and Organisation of the Pole build the skeleton of the subjects in chapter five and six. The reason is that the human resource policies at Camaçari at least are entirely dependent on the nature and organisation of petrochemical industries that are by far the biggest economic activity in the area. Human resources include not only people working in the pole, but also those affected by the installations of the industries without having any straight relationship with them. In this sense, chapter five - "The Human Resources Policies" - and chapter six - "The Local Community" are exactly two sides of the same coin. The local community is an extension of the human resources policies that will have been discussed in the preceding pages. This means that we firmly believe that the manpower problem cannot be treated separately from its environment or from the community. Moreover, as each person should take responsibility for the problems he creates, so should the enterprises. They have a solid task of putting order in the whole of an underdeveloped area where this large industrial complex is set up. Unfortunately, these new interactions between the pole and the community are only very strong and evident at Camaçari and not throughout the NE. For this reason the last chapter is restricted to that Municipality only.

There have been some researchers on the North East Petrochemical Pole which have tried to analyse industrial complexes from quite narrow angles. They are related to financial, or economic or managerial aspects of certain progresses. This present work has, of course, a wider range. It covers social policies employed by the petrochemical companies, plus the effect those policies have on the indigenous population and vice versa. It is not only a managerial, a technological or a manpower approach. A narrow approach such as those described above would make no sense at all at this stage, since we cannot distinguish managerial, social, political impacts received by any community due to an industrialisation process. That is the reason why we have chosen the expression "Human Resources" which has a broader meaning than labour or manpower. Has the region benefitted from the coming of the NPP? What are the objectives behind the industrialisation of the North East? Are the policies developed by the managers in line with the initial objectives stated by the Government? These questions imply some connotations beyond the strict field of an industrial relation plan, or even, beyond a corporate manpower sub-plan. We are looking at a business-government corporate experiment in solving the problems of planning and of implementing human resources policies in large industrial estates.

This approach raises additional problems in our work. From a pure capitalistic point of view, an industrial organisation is set to produce a given amount of certain goods with the highest possible profitability. That is not the case in the NPP (\*), by its very nature and origin. There are a number of characteristics which make the management of the whole complex essentially different from the simple administration of a big corporation. From the outset, the NPP is much more concerned with social values than any normal private company, regardless of its social approach to business, because the NPP results from government intervention addressed directly to the regional development.

(\*) North East Petrochemical Pole

## CHAPTER FIVE

In dealing with chapter five, we have discussed initially the problems regarding demand and supply of human resources for the pole and then we have divided them into different categories, namely:-

- The Entrepreneurs;
- The Managerial staff;
- The Professionals and the Technicians;
- Skilled workers.

Our aim was to produce policies in the long- medium- and short-run for each one of those categories. We have found that the pole has a role to play in encouraging the arrival of new entrepreneurs. It is fair to say that entrepreneurship has to face the difficulties of lack of capital, experience and knowledge of the proper technology to build new industries in this field.

The performance of the NPP in fostering new entrepreneurs can be much more effective if policies intended to back regional efforts of entrepreneurship are taken. These policies are in the field of financial credit, technical cooperation and specific incentives for those firms already settled at the area, as well as those others who must be attracted if development is to proceed.

As far as managers are concerned, we have studied a long-term strategy to fit the needs of the industry. For the professionals and the technicians, we have defended the idea of a Federal rather than a strictly regional strategy for them. Those people form the front line of the nation's efforts to develop its own petrochemical industries. RMS (\*) then, has a very first responsibility to make a way for the consolidation of a scientific infra-structure of knowledge in petrochemicals and its transformational segments.

(\*) Metropolitan Area of Salvador

For the skilled workers, however, the strategy is regional, since it implies quite a lot of work with on the job training programs. Moreover, this is the kind of worker equally needed all over North East not only for petrochemicals but also for every other kind of industry.

#### CHAPTER SIX

Unskilled workers are dealt with in chapter six on "The Local Community". Being a small community and prime receiver of the first impact of the pole, Camaçari can be a thermometer of the socio-economic effects of the petrochemical industrial complex. As a government-business venture with strong social implications, the development of Camaçari is an initial guide to find out the commitment of the authorities to reach the desired goals. A study showing the impact of the pole is, then, made with successive headings on decentralisation and concentration of industries, infrastructure, migration, different aspects of the local government social policies, regional linkages and a comparison between the traditional activities of the town and the employment of unskilled workers. We have detected that the human resources have not received proper priority up to now in the planning and management of the pole, despite a significant growth in the revenue of Camaçari and of the State of Bahia derived from taxation on the goods produced at the pole. Based on these facts, we turn, then, to propose an overall strategy for the enlargement of the benefits of this industrial complex for the whole region and for Brazil. This strategy points mainly on the strengthening of the planning process of the Metropolitan Area of Salvador, a better distribution of functions and responsibilities among all the private and public units operating at Camaçari and the backing of those segments of the petrochemical industries with strong regional linkages for which the NE shows natural advantages.

### BASIC CONCEPTS

To arrive at these conclusions, we had to work with some concepts which deserve an initial explanation, since there are wide controversies about their exact meaning and we need to show the reasons why we have brought them in. We refer specially to (i) employment; (ii) business policy; (iii) manpower planning; (iv) human resources; (v) regional linkages; (vi) industrial pole and industrial complex and (vii) social objectives.

#### I. EMPLOYMENT

We were not concerned with the concept and definition of an employed person\*, but with the fact that the growth of industry and of economic activity as a whole has not provided sufficient jobs to balance the growth of the population or even to compensate for the annual entry into the market of thousands of young people leaving school. As the most prominent industrial investment in the region, the NPP has to show multiplier effects in terms of jobs. Otherwise, it will not meet its objective of making a substantial contribution in reducing the growing unemployment problems.

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\* The census in Brazil considers that 'a employed person comprises all persons working during the survey week and those who although not working had a job or an enterprise from which they were temporarily absent for some reason, such as sickness, vacations, strikes etc' (FIBGE - (1971). This is very similar to the criteria adopted in USA census (Ross, 1967).

It is worth realising that the creation of employment was closely related to the initial decision to locate the pole in the North East. Bearing this in mind we must look for policies to reach that objective - the creation of many jobs - in the implementation of the project. A hierarchy of industries with strong employment potential, for instance, must be established. Other measures to reach the same objective range from establishing criteria to select labour intensive industries for the region, to the substitution of labour for technology every time that it is possible in the petrochemical process. We have checked these criteria.

We must keep in mind two facts throughout this work. The first one is that a good business enterprise must benefit from the natural advantage of its location: abundant and cheap labour is theoretically an advantage of the North East. The second one is that the petrochemical industries are organised in form of growth poles whose great advantage is the linkage grid they establish in a given area. The question is whether the management will be able to put those theoretical advantages into practice, because these same factors, if they are not managed properly, can bring serious damage to the regional firms already established in the area. The arrival of new industries might only create inflation of salaries and prices, and by disturbing other economic activities, due to its linkage grid, lead the whole of the ancient and incipient industrial organisations into bankruptcy.

## II MANPOWER PLANNING

We have taken a "macro" view of this concept which sees manpower planning as a set of activities and decisions related to the use of people to work or to prepare them for future work needs. There is a vast literature on business, such as Levitan, (1976), Council (1979) Strans & Sayles (1972) and Bell (1974) that can back this approach. We have divided this heading into different

categories (see Chp. 4) including entrepreneurs and managerial staff. Our intention has been to analyse if the labour market was prepared to supply the pole with those workers and also to find out the extent to which the arrival of the petrochemical industries has affected that market. After this overall study of the characteristics of the general supply and demand in the regional market, we passed on to analysing the specific requirements of each one of those categories.

### III. BUSINESS POLICY

This research is about Business Policy in the first place, despite having topics such as human resource policies as sub-headings. Business policy here means the "key long- and short-term implications" of the establishment of the NPP (Rodgers, p.1). We are concerned with the overall strategy of that government headed scheme for the whole region and its components parts.

### IV. HUMAN RESOURCE PLANNING

With this expression, we mean all those measures that directly affect people in close relation to the industrial pole. It comprises both the internal and external plan as defined in section 5.2. In this way we agree with Levitan's concept that jobs, manpower, education, training and welfare are all components of human resources development programs (Levitan, p.537).

### V. REGIONAL LINKAGES

As was first envisaged by Perroux (1950), the theory of the growth pole relies heavily on industries with high growth potential and regional linkages. The leading industry should buy its feed stocks from and sell its output to other industries within the same region. This creates a



regional grid of industries.

In an underdeveloped area, where the manufacturing sector is very weak the management of the NPP might not find an easy task to fulfill this goal. There is a national tendency for industries to offer their products in the Sao Paulo market first, leaving other areas of very low income per head for marginal sales. If this tendency prevails, the whole philosophy of the pole breaks down.

It is a challenge for managers, the creation and finding of regional linkages for the output of the NPP. As in this research we are very concerned with the human resources policies, our intention is to show how those policies can affect for better or worse the formation of a regional grid of industries to support the NPP.

The direction of a growth pole requires much more from managers than a simple set of industries. First, they will need to have a twofold effort to run the business well - a scientific approach to management and a regional approach to development. How far can managers from areas other than the North East turn their backs on their original regions and behave properly in the management of the NPP?

The NPP is a planned, not a spontaneous pole, where managers are brought up within the community, know its values and problems, exert natural leadership and are already linked to its social network system. In a planned pole, managers have to be trained for it, they are commonly recruited outside the area, are strangers to the local community. They must be above all professionals. How far can these professionals absorb the values and needs of the local community?

#### VI. INDUSTRIAL POLE AND COMPLEX

"Industrial pole" here implies the whole complex of petrochemical industries in the region plus other industries depending on it, hence we generally refer to it as the NPP - North East Petrochemical Pole. On the

regional grid of industries.

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other hand, we reserve the expression "industrial complex" to designate the petrochemical industry settled at Camaçari and surroundings. The complex is the core of those industries, which process the basic and intermediate petrochemical products (see chapter three) and are settled at the COPEC (see chapter one) which is also at Camaçari.

#### VII. SOCIAL OBJECTIVES

"Business is not created in a vacuum". The discussion of the social objectives of industries are very often imprecise and subjective. We have restricted the limits of this heading to those quantitatively measurable aspects. The first limit is related to the geographical area. As the basic complex is settled at Camaçari, this research has concentrated its efforts on social changes which have taken place in Camaçari. At this stage, it is virtually impossible to assess the effects of the pole in the whole region. However, we have tried to work on the perspective of increase in tax revenues, since they can be a useful instrument of social policies for the years to come. At least, it is possible to know whether the arrival of new industries will give the local community funds enough to tackle its new problems of immigration, housing, education, training, urbanisation and pollution to quote only a few of the whole range of social objectives.

We can hardly talk about business as being socially responsible if these problems are not solved. Our assumption is that an industrialisation project is worthless, if it is not capable of solving, at least, these problems it creates by its own presence.

Finally, we find that this is an open-ended research, as the less-than-three year old pole does not offer sufficient material for convincing conclusions. Nevertheless, this research has explored several points where

the present policies can be criticised and new alternatives are proposed. Anyway, as the purpose of management science is not to give the last word on any subject, but to propose better solutions for specific problems, that is what we have tried to do.

## CHAPTER 1: REGIONAL BACKGROUND

### I.1. INTRODUCTION

This chapter deals with those characteristics of the North East that are important for the development of the petrochemical pole. The study of the region made us particularly concerned with the following points:-

- (i) The North East with more than  $1.5 \text{ m Km}^2$  seems to be too big an area for an industrial complex localised in a single point of its territory to have a major impact on all its territory;
- (ii) A population around 33 million with a high rate of urbanisation and three major (each over 1 million inhabitants) metropolitan regions (including the metropolitan region of Salvador which includes the municipality of Camaçari) does not indicate necessarily great economic advantages for the pole. Even the abundant supply of unskilled labour can only be an advantage when it is adequately combined with the skilled labour available;
- (iii) Low consumption, low income per head, low level of literacy and poor quality of education, impoverished urban areas, the absence of straightforward linkages between the petrochemical industries and the traditional economic activities of the North East are prominent factors which militate against the success of the pole; whereas, the presence of hydrocarbons, other mineral feedstocks, the possibilities of establishing new economic linkages, the processing of raw materials in the North East are factors which, if well exploited, could bring enormous advantages for the regional development.

By breaking up the region into its component parts (see next page), we have analysed the extent to which those environmental variables work against or in favour of the pole, which will help us in the building up of a strategy throughout this thesis for all those petrochemical segments

Diagram No. 1/1 - BRAZIL AND ITS REGIONS





that can well be adapted to the realities of the North East.

## I.2. THE NORTH EAST

In geographical and administrative terms, Brazil is divided into twenty-two states (Estados), four Territories under the Federal Government Jurisdiction and a Federal District, which are in their own turn subdivided into Municipalities. Those states and territories are grouped according to geographic, political and socio-economic similarities to form five distinct regions: the North, the North East, the South East, the South and the Centre West (see map). The petrochemical industry is settled mainly in the South East, North East (the recently built complex at Camaçari) and in the South (Porto Alegre). From those regions, we are particularly interested in the North East region - and inside that region, the state of Bahia with its metropolitan region of Salvador, that includes the municipality of Camaçari. In summary, we may present the following scheme:

Brazil	Federal Government
States	States' Governments
Municipalities	Municipal Governments
Regions	No Regional Government.  (The States are grouped according to their geographical proximity and economic similarities to form regions - 5 in total - that have a Federal Government department for planning affairs generally. The first of those departments was 'SUDENE' - the superintendence for the development of the North East.
North East	9 states, including Bahia
Salvador	Capital of the state of Bahia  (Salvador together with another 7 municipalities, including Camaçari, form the metropolitan region of Salvador)
Metropolitan Regions	No metropolitan government, but different government bodies or public enterprises with planning functions or with a role to coordinate government policies for the area.

Brazil is approximately 8,511,965 km<sup>2</sup> country, from which area the North East shares around 18% - 1,542,711km<sup>2</sup> and contributes with 30% to the Brazilian population (see table 1.1).

Table n.1.1. Evolution of Brazil and North East Population since 1872.

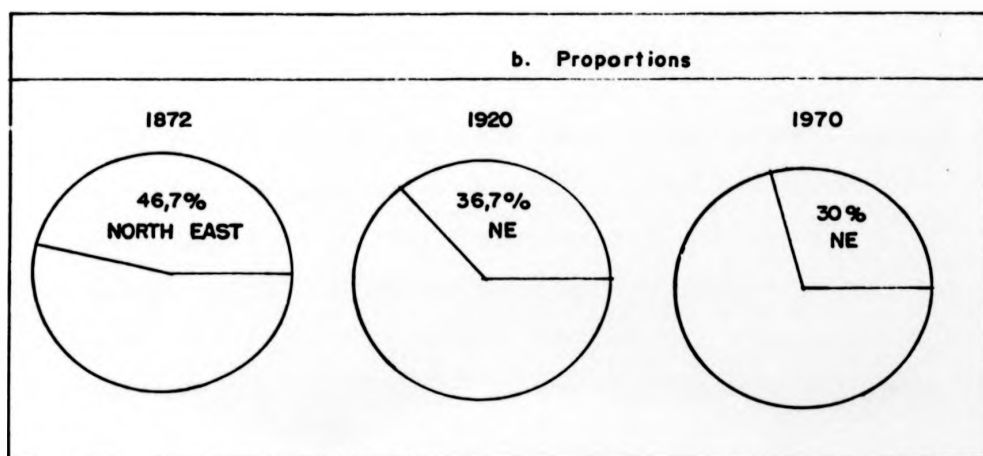
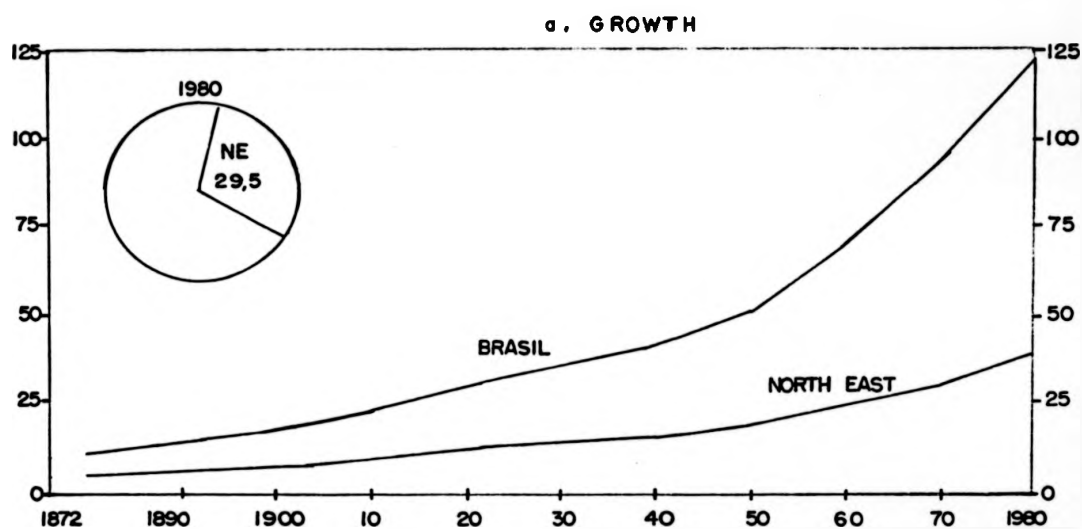
Year	Brazil	North East	North East/ Brazil (%)
1872	9,930	4,539	46.7
1890	14,334	6,002	41.9
1900	17,438	6,750	38.7
1920	30,636	11,246	36.7
1940	41,236	14,434	35.0
1950	51,944	17,973	34.6
1960	70,967	22,427	31.6
1970	94,509	28,675	30.3
1975 *	107,145	32,032	29.0
1980 *	123,032	36,251	29.5

Source: FIBGE - Anuarios Estatísticos do Brazil

\* Estimates

Having almost one-third of the Brazilian population, the North East shares less than 15.0% of the Net National Product. It is considered a problematic and extremely poor region, compared with the South East, a nearly developed area with good infrastructure, communications, roads, services and a well established industrial basis. By any index we use to compare the North East with the South East, the first appears as a poorer area. Its income per head is smaller; in immigration terms it is a net loser of population; the primary and secondary sector of its economy has more weight than in the South East etc.

Diagram No. 1/2 - Growth of the Population of Brazil and North East  
(Period 1872 - 1980)



SOURCE: TABLE N. 1/1.

The first point of colonial settlements, and, at the beginning of colonisation, the most developed part of the country, that region was stagnant for the most part of the last few hundred years. Furthermore, its economy has had a slower pace of growth than other parts of Brazil in the last years - 6.9% between 1960 and 1978 for the North East and 7.5% for Brazil.

Table n. 1.2. Growth rate of the GNP of the North East and of Brazil in the period 1949-1978.

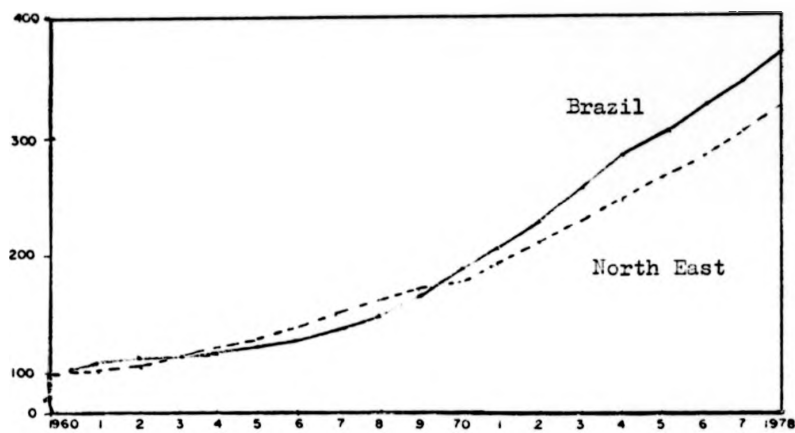
Year	North East	Brazil
1949-59	7.0	6.6
1961-62	5.0	7.8
1963-67	6.4	3.2
1968-74	7.4	11.2
1975	7.4	5.6
1976	6.7	9.0
1977	8.2	4.7
1978	6.0	6.3

Source: Revista Economica do Nordeste, v.10 (2), 195.

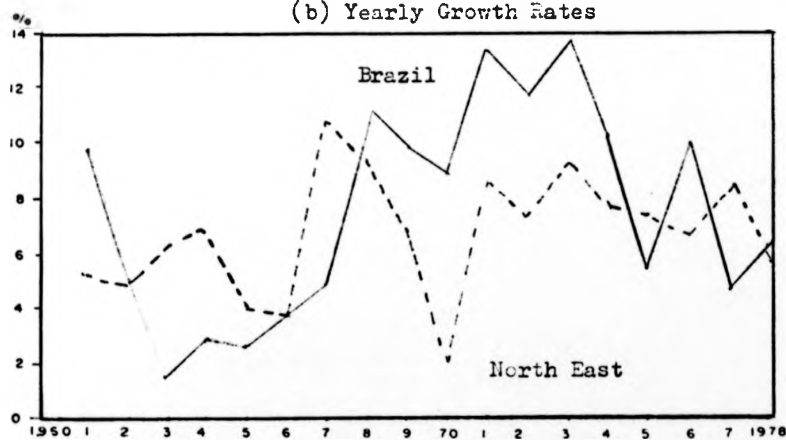
That average rate of growth does not classify the North East as a stagnant region anymore, but as one growing poorer in relative terms. The North East is growing, but losing ground and position in relation, to the whole nation. In effect, recent studies by the Banco do Nordeste do Brazil (BNB), using data from FGV and FIBGE, has emphasised the continuous decline of the North East position in the Brazilian economy.

Diagram No. 1/3 - Growth Rates for Brazil and the North East.

(a) Net Product - Indices: 1960 = 100



(b) Yearly Growth Rates



Source: Revista Economica do Nordeste, v. 10(2)

Table n. 1.3. Domestic Income, Population and Income per head of the NE  
as a percentage of the total for Brazil.

Variable	1949 %	1959 %	1970 %	1978 %
Domestic Income	13.9	14.4	11.6	10.4
Population	34.6	31.6	30.3	29.6
Income per head	40.2	45.6	38.3	35.1

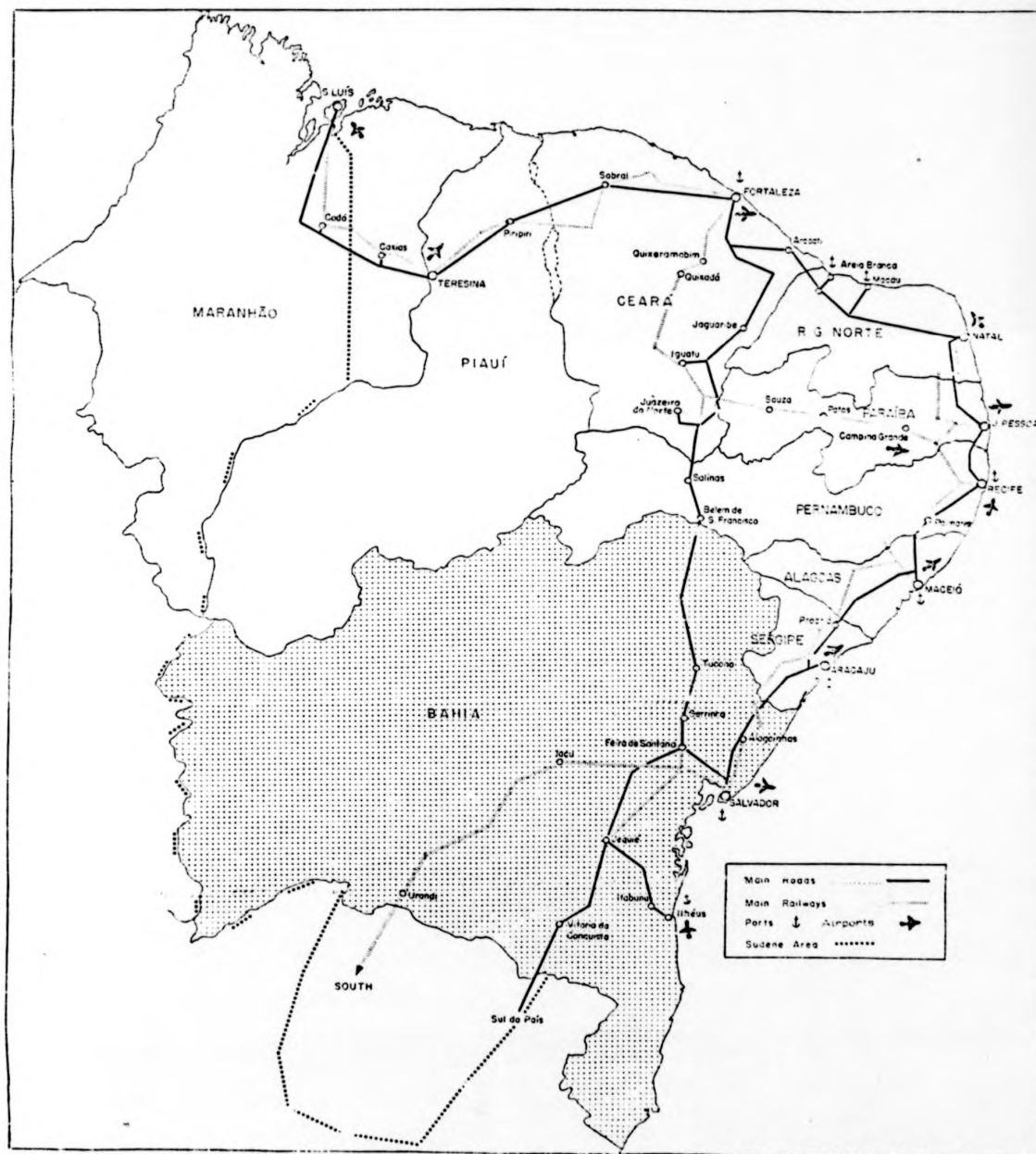
Source: Revista Economica do Nordeste, v.10 (2), 198.

This decline is due to several reasons that determine a pattern of economic behaviour in the North East very different from other Brazilian regions for a long time. This problem, however, was only really realised after the Second World War, according to Albuquerque (1976). Notwithstanding this, efforts to bring under control one of the most serious sources of that stagnation go back to the last century with the attempt to counteract the effects of the long droughts which affect the traditional agriculture of the region (section 2.1).

#### 1.2.1. SPATIAL ASPECTS AND COMMUNICATIONS

The diagram n.1.3. shows that the most important towns of the North East are just on the coast. Salvador, Recife and Fortaleza are the three major conurbations with population over 1 million people each. These are the three main markets and they are responsible for almost the totality of the industrial production. All but one of the nine States has its capital - that is also the most important town - on the coast. The exception

Diagram No. 1/4 - The NE Region.



- Teresina - a town of about 500,000 inhabitants in the poorest state of the region.

Transport is basically by roads. Being that the main cities are on the coast, shipment is also an open option for the transport of petrochemicals. There are ports at the main towns of all the states. The bottleneck of the transport system is the railways, that have old and narrow tracks and serve only a small number of towns through twisting routes. If there were better rail linkages between the main towns in the North East and also good connections with other regions in Brazil, many problems derived from the transport of goods could be abolished. Apart from the cost of transport itself, there is also the problem of oil fuel used by trucks that contributes also to make hydrocarbons feedstocks even more expensive. For an initial estimate of the dimension of this problem, road distance from Salvador (second petrochemical pole) to Porto Alegre (third pole) is 3,065 km, to Sao Paulo 1,950 km, to Recife 835 km and to Sao Luis 1,645 km. All the states also have regular connections by flights of the Brazilian airlines, and the telecommunication system and the telephone network is of good standard in the main towns.

#### 1.2.2. ECONOMIC CONDITIONS

This extensive region, as we may expect, is not homogeneous in its physical and economic aspects. It represents a variety of climates and cultures, but the arid areas of its hinterlands from which periodical droughts have expelled millions of its inhabitants to other places in Brazil has assumed a major role in the planning process of the North East. We will return to this point in the next chapter, when discussing the Government policies in the area.



In a variety of climates and soils, a development of distinct agricultural crops has been the economic basis of the area. Sugar cane, cotton, cocoa, tobacco, coconuts are among other important products in the export activities of the North East. Cattle have also had a major but less important function than the above commodities.

The extractive activities have acquired a prominent role after the discovery of oil in the State of Bahia. There are other mineral materials in the area which give these primary industries a bright prospective in the future. The existence of hydrocarbons and copper in Bahia, potassium and chloride in Alagoas, potassium in Sergipe and other minerals in the nearby states has given strength to the argument that this is a region with a natural base for the chemical industries and the most suitable location for the heavy chemical companies. It is a problem of defining if the best location of the petrochemical industry is near the consumer markets or the production areas. Due to the characteristics explained in chapter three, it is clear that the advantages of being near the production and refining areas are bigger than at the consumer markets. (section 1.2.4 and chapter 3).

In the 60's and 70's, agriculture remained static, while industry underwent a significant growth. The main efforts of State and Central Government were also directed to the manufacturing sector, the main reason why it experienced a disproportionate increase.

Despite its poverty, the export/import balance has been showing for a long time a positive result. Furthermore, the tourism industry brings each year thousands of people to the North East towns, beaches and festivals, especially Carnival. Despite these facts, the North East is always seen as a problematic area. People react saying that the truth is a continuous transfer of income from North to South. Moreover, the

North East exports its products with an artificial rate for the dollar - low rates to allow industries, settled mainly in the South East, to import machinery - while it has to buy Brazilian manufactured goods that are much more expensive than similar products abroad. Regional development in this way is more complex than the economic development of a country. The latter can put barriers, tax the imports and even ban certain goods that are produced internally. This is not the case for the regions. It is not an usual practice to create customs between regions of the same country. Here a free competition benefits the region where industrialisation first takes place, in this case the South East.

It is in this background that the petrochemical pole of the North East was developed and against these poor economic performance that it is supposed to work.

### 1.2.3. AGRICULTURAL SECTOR

Notwithstanding the climatic adversities, agriculture is still a very important sector in the North East, responsible for about 20 to 30% of the regional net income and two thirds of its labour force (BNB 1978, p.243). If the importance of this sector has been declining in terms of income and of productivity, agriculture continues to be very important for its share of the labour force it employs.

Table n.1.4. Structure of Regional Income in North East and In Brazil  
in 1949, 1959, & 1970. (%)

Area and year	Agriculture	Industry	Services	Total
North East 49	36.6	15.3	48.1	100
59	40.2	14.4	45.4	100
70	19.4	15.1	65.5	100
Brazil 49	26.6	22.0	51.6	100
59	20.8	27.7	51.5	100
70	11.2	30.4	58.4	100

Source: FGV - Contas Nacionais in Revista Economica do Nordeste,  
v.10/2), 244.

Agriculture is the main source of the regional exports accounting for approximately 94% (BNB 1979, p.249) in the period 1960-75. Researchers are agreed that this is a crucial problem. Agriculture has low productivity because it is traditional and not mechanised and there is a lack of integration between it and the regional industries. Agriculture and industry have been developing with no attempt to build complementary links between a major agricultural commodity and an industrial sector, for instance, between the culture of sugar-cane, tobacco, cocoa and cotton on one side and fertilizers, tractor industry on another.

(a) Linkages to the petrochemical industry

There is also no straight tie-up between petrochemical industry and a local agricultural crop, except to a possible development of a fertiliser complex based on oil feedstocks. In this respect, an alternative project to the petrochemical industry shows a stronger link. It is the alcohol chemical complex that can be settled in the North East based on the traditional sugar cane industry.

(b) Alcohol based chemical industry

An ethylene plant based on alcohol would revitalize the sugar cane industry, promote the creation of jobs on rural areas avoiding the traditional expelling of peasants and exerting a strong pressure for more productivity of this agricultural sector. There is a very slow movement towards these alcohol chemical industry with even close-down of some old plants of this industry in the South East to favour the petrochemical industry before the oil crisis of 1974. Even today the steps toward the alcohol chemistry are very weak and do not proceed on a steady basis.

In effect, there are some comparative problems that deserve an initial solution for a more stable development of this industry - comparative costs with the petrochemicals, scale of the plants, and capacity of the agro-industry to supply the chemical plants with the required amount of alcohol. The problem is that Brazil has no control on the price of oil, notwithstanding the national production of gas and oil for the petrochemical pole in the North East (see 1.4). The main argument is based on the employment aspects as a result of the development of the alcohol-chemistry. That could compensate for eventual disadvantages.

The scale is the following problem. While the ethylene plant at Camacari is for 360,000 ton/year, the highest capacity plant based on alcohol in Brazil is 60,000 ton/year, which requires  $60,000 \times 1.72$  tons of alcohol approximately. Could the agro-industry provide alcohol for higher capacities? At the short run, it is very difficult, but the country has sufficient land and the possibility to produce much more alcohol in the medium term. In a study about the expansion of alcohol production, the North East is said to be able to produce more than 2.1 thousand tons per year, which would result in 170,000 new jobs. Today, this estimate is considered pessimistic (SUDENE, 1976). As alcohol is being reserved for energy to replace oil for the reduction of the national import bill, there is no immediate need of a replacement of the petrochemical industry by alcohol-chemistry at any aspect. The road is open, however, for incentives and encouragement to this industry to adapt its technology to build alcohol ethylene plants with higher capacities, to provide alternative feed-stocks for the chemical industry in Brazil in the long run.

#### 1.2.4. HYDROCARBONS

The main oilfields in Brazil are located in Bahia, Sergipe, Alagoas and more recently new wells were discovered in the South East. Other oilfields were discovered in Rio Grande do Norte, also in the North East.

In summary, the North East is responsible for more than 99% of Brazilian production of oil. Bahia is the main producing area with 86.5% in the period 1970-75, followed by Sergipe 12.5, Alagoas, 0.6% and Espirito Santo 0.4%. That production, however, important for the Brazilian economy is not sufficient for the internal consumption and the nation is heavily dependent on the external markets importing about 2/3 of its needs. But the nation is self-sufficient in terms of refinery capacity.

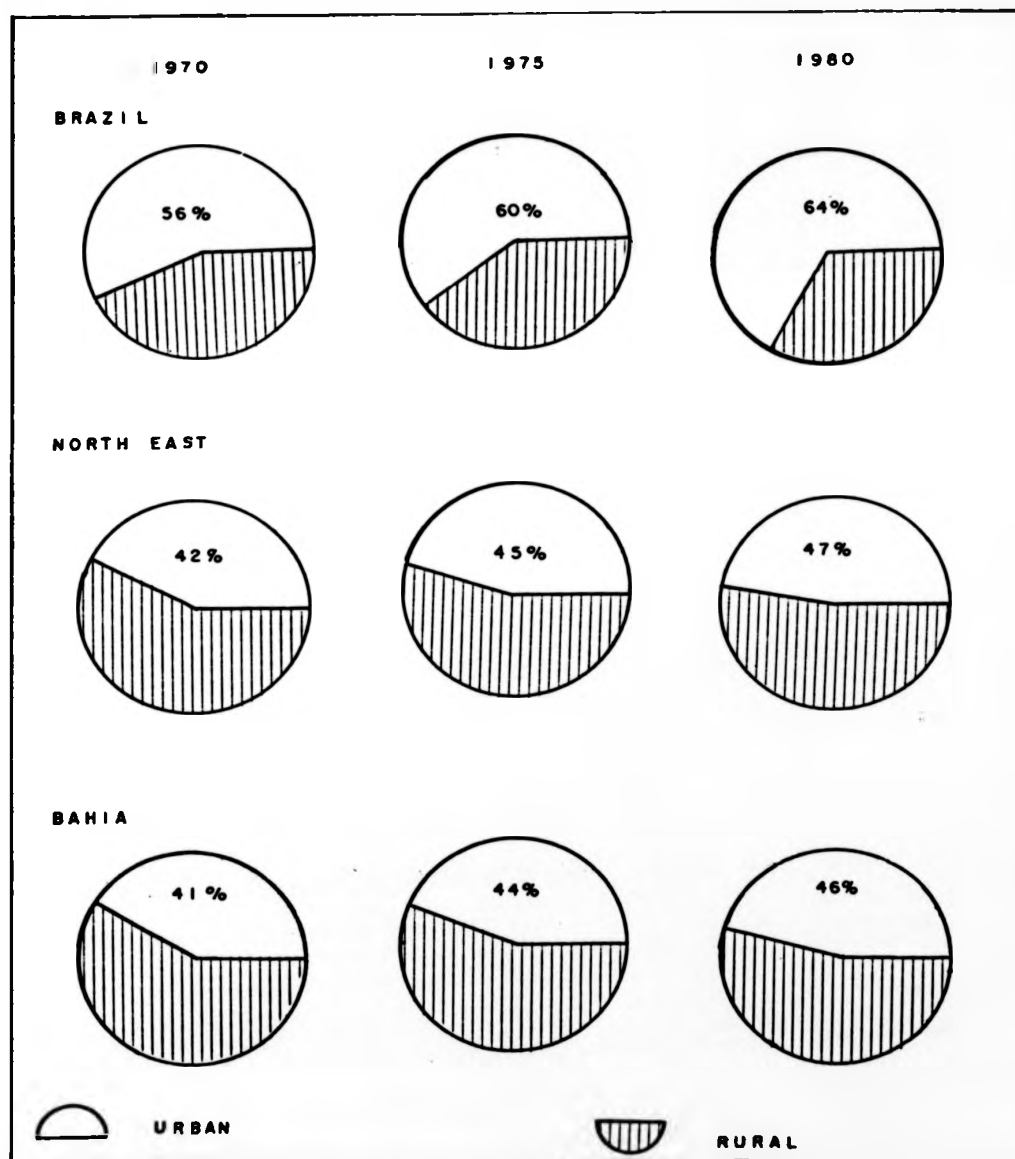
Natural gas, the other important raw material for petrochemicals is found mainly in the North East that represents about 99% of the national production. Bahia and Sergipe are again the most important producing states. Taking the presence of the raw materials in the region and the national imports of these products, the logical economic location of the heavy petrochemical industry is naturally near the oilfields (see Chapter 3). The so-called regional development flag as a political strategy to convince the Government to install the second petrochemical pole in the North East and not in Sao Paulo was only an euphemism to locate the pole where it should logically be. The regional objectives of that decision, however, are even more important in the face of this economic advantage and should be discussed to the fullest as we intended to do with some aspects of it in this thesis.

#### 1.2.5. DEMOGRAPHIC ASPECTS

##### (a) Relation between Brazil and the North East

In general terms, the whole picture of the North East population can be considered either as a problem or as an economic resource. As a problem, because it represents a population with low literacy, poor state of health, uneven distribution of wealth, low income and consumption and very weak productivity. As an economic resource because it can be converted into labour for the market.

Diagram No. 1/5 - Urbanization Process of Brazil, the North East Region and the State of Bahia. (Proportion of the urban and rural population).



SOURCE: FIBGE - ANUÁRIOS ESTATÍSTICOS DO BRASIL

As a proportion of the Brazilian total, this population has been steadily declining, but in absolute numbers it has grown from 18 mil. in 1950 to 32 mil. in 1975. The cities are the convergent points of that increase. The urban population is estimated to be around 47% against 34% in the Census of 1960. The growth of these urban areas require extraordinary efforts to create jobs for thousands of men and women that enter the labour market each year.

Specialists on employment recommend measures towards the change of the social structure of rural areas, the creation of massive labour intensive industries among other policies.

#### (b) Urbanisation

The urbanisation affects not only the capitals of the states, but also many other cities around the coast, where the urban network of the North East has been developing. Even so the increase in population of the three metropolitan areas of the region has been abrupt. In approximately thirty years, all the North East capitals have trebled in population. Today the participation of the capitals in the urban and total population of its respective states is shown in table n.1.5. Fortaleza and Recife share more than 60% of the urban population in their respective states and Salvador is responsible for 37.8 % in a state with 559,451 Km<sup>2</sup>.

At first sight, it seems that this urban population is a favourable consumption market for an industrialisation program. This first impression vanishes when we analyze how this population is increasing, the infrastructure problems, income per head and the general socio-economic conditions prevailing in these areas.

#### (c) Migration

Migration lies at the root of any serious study about population growth in the North East. Using data from demographic Censuses, a BNB paper has shown the net losses of the regional population. This migration is mainly

from rural areas and small villages and towns to larger cities, inside or outside the region. (see table n.1.6.).

Table n.1.5. North East: Share of the capitals in the urban and total population of their respective states 1975.

Capitals	Total population in abs. numbers 000's	Share (%)	
		State population	Urban State population
Sao Luis	330	19.9	34.9
Teresina	290	14.5	41.3
Fortaleza Metropolitan area	1,317	25.8	60.4
Natal	344	18.2	37.5
Joao Pessoa	288	11.0	24.3
Recife - Metropolitan area	2,153	36.8	63.3
Maceio	324	18.1	42.8
Aracaju	226	22.8	46.2
Salvador - Metropolitan area	1,401	16.6	37.8

Source: FIBGE - Anuario Estatistico do Brazil - 1978

That means that the region is losing population relative to Brazil as a whole even so it continues to grow. These facts must be considered at any program of regional development. Employment and new jobs are again the dominant issue.



Table n.1.6. Migration Movements in the North East

Discrimination	1950	1960	1970	(% ) Growth Rate	
				1950/60	1960/70
a. Persons born and present at the region	17,854	21,906	27,873	2.1	2.4
b. Persons born in the region and living outside	1,025	2,402	3,726	8.8	4.6
c. Natural population (a + b)	18,879	24,388	31,599	2.6	2.6
d. Persons born outside but living in the region	118	170	237	2.6	3.4
e. Total population living in the region (a + d)	17,972	44,155	28,110	2.1	2.4
f. Migration - Gains (+) or losses (-) d-b	(-)906	(-)2,232	(-)3,489	9.5	4.7

Source: FIBCE Censuses in REV. Econ. Nordeste, v.10(2), p.204

(d) Regional Income

Regional income is also running behind the national average. Income per head was Cr\$ 634,58 in 1970 against, Cr\$3,385.30 in Sao Paulo and Cr\$ 1,644.02 in Brazil (BNB 1979, p.229). Furthermore, around 70% of the economically active population of the region had earnings equal or less than the minimum allowed in Brazil, (including those without earnings), that is inferior to US\$100 a month. Other indicators of health, level of education, nutrition also point to a precarious picture of the socio-economic situation of the region.

(e) Literacy

In 1976, roughly half of the population five and more years old was illiterate; if we take the 15-39 year old age group that rate of illiteracy falls down to 36%, which is still high for a group of working age. A hope is that the enrolments in all the levels of education is increasing. In 1974, there were 143,816 school leavers of the first level (9 years), 62,515 of the second (11 years) and 13,939 of the third level (University). These school leavers came from a network of 79,578 units of first level, 1,978 of the second level and 90 institutions of higher education, including 14 Universities. These figures show an extremely low proportion of school leavers in relation to school units, and that a great proportion of students did not finish their courses. Apart from the thousands of people who do not complete the basic level of education, the figures for higher levels, though a low proportion of the total population at schooling age, is theoretically sufficient for an area with few jobs for skilled labour. We will discuss this topic fully in the chapter on human resources. We are conscious that these global figures must be taken with caution since that qualification and the break-down of those numbers into the specialities of the school leavers are essential for an accurate understanding of the problem. For an introduction, however, these data are sufficient to show the environment where the petro-chemical pole of the North East was settled.

(\*) In 1970, US\$ 1.00 = Cr\$ 4.6 approx.

(f) Economically Active Population

A quick analysis of the economically active population will give more light on the situation of the human resources in the North East (1970).

Table n.1.7. Economically Active Population of the North East in relation to earning levels (%)

Earnings Levels Economically Active Population	North East			Sao Paulo	Brazil
	Total	Rural	Urban		
Those without earnings or with less than the official minimum in Brazil	68.1	76.7	88.2	20.6	45.2
Min.* x 1 to min x 5	27.6	19.0	11.0	60.2	43.9
Min x 5 to min x 10	2.6	2.6	0.5	11.6	6.4
Min x 10 to min x 20	1.2	1.1	0.2	5.2	3.0
More than 20 'minima'	0.4	0.5	-	2.3	1.3
Unknown	0.1	0.1	0.1	0.1	0.2
Sub-total (%)	100	100	100	100	100
Total Economically Active Population (A) Abs. Numbers	11.6 m			8.8 m	39.8 m
Total Population (B) Abs. Numbers	22.9 m			16.9 m	78.1 m
A/B (%)	50.6			52.1	50.8

\* Minimum = The official minimum an employer can pay in Brazil.

Source: FIBGE. Anuario Estatístico do Brazil - 1978

That is a sad picture of poverty. The North East has more than  $\frac{2}{3}$  of its economic active population without earnings or with less than the official minimum (around US\$ 80.00 per month) in Brazil. Summing this group with those in the range of 1 to 5 'minima', we would get more than 85% of the Economic Active Population.

Table n.1.8. Economically Active Population in relation to the total population of the North East, Sao Paulo and Brazil.

Area	Economically Active Population (A)	Total Population (B)	Relation A/B (%)
North East	11,591,000	22,879,000	50.6
Sao Paulo	8,791,800	16,875,000	52.1
Brazil	39,717,900	78,147,000	50.8

Source: FIBGE - Anuario Estatístico do Brazil - 1978.

### I.3: BAHIA IN THE CONTEXT OF THE NORTH EAST

The state of Bahia is the frontier between the poor North East and the more wealthy South East. It is the biggest state of the North East, and most populated state in area and population. These points together, its wealth of natural resources and its tradition in Brazil as an important political, cultural and economic centre in the past reserve for that state a relevant role to play in the development of the North East. Although the state economy has until recently been based on the export of primary goods and on secondary activities - a situation that is common to the region

as a whole - there are certain characteristics that are peculiar to Bahia alone. One of these is the fact that Bahia, thanks to the diversity of its climates and ecological conditions was able to develop several agricultural products on a full scale. Examples of those are sugar, tobacco and more recently cocoa which helped to compensate for the decline of the sugar industry. As a consequence, Bahia became the leading exporting state in the region, and still retains this leadership with a current share of some 35% of the total value of exports from the North East.

Farming principally for the export market is still the mainstay of the states economy, in spite of the fact that many new industries have arisen.

#### I.3.1. Industrial Concentration in Bahia

An important aspect of the development of Bahia is the concentration in the Metropolitan area of Salvador (RMS) of population, investments, financial resources, employment and income. Not only has the number of inhabitants of the area consistently grown at rates twice those of Bahia as a whole, accounting for 15% of the whole state at 1975, but most large companies in the secondary sector are situated there, accounting for over two-thirds of all urban employment calculated for the whole state in 1970. The RMS, then, has been the focal point for investments and developments since Petrobras\* moved into its area and even more so since an industrial district was established in it. This may be explained by the following factors:-

- (i) The size of Salvador with its market, population, urban services etc.
- (ii) The availability of valuable raw materials such as oil, natural gas and others.
- (iii) The presence of Petrobras, with its prospecting, production and refining activities.

\* Federal Government owned oil company

(iv) State Government investment in infrastructure (see 1.4 and 1.5).

(v) The policy of tax incentives (see 2.1)

Apart from these aspects of concentration, the recent industrial development of Bahia indicates a pronounced tendency towards the specialisation of the secondary sector established in RMS. The investments are, for the most part connected with the production of intermediate goods, and to a lesser extent, with capital and consumer goods. In the case of intermediate goods, chemical products are the most prominent.

#### I.4: THE METROPOLITAN AREA OF SALVADOR (RMS)

The RMS is composed of eight municipalities: Salvador, Lauro de Freitas, Simoes Filho, Sao Francisco do Conde, Itaparica, Vera Cruz, Candeias e Camaçari (diagram n.1.6). Together these units cover an area of 2.183 square kilometres and had a population of 1,147,821 inhabitants in 1970 (see table n.1.9). Their per capita income would be around US\$ 400 about twice the average for the state, according to an estimate of an agricultural project developed for the region. The RMS has suffered a process of unequal development and still has marked disparities in its population services and socio-economic infrastructure. The municipality of Salvador, the fifth largest city in Brazil (with a population of 1,3 million inhabitants according to the 1975 IBGE estimate) is the most developed area. The establishment of industrial districts, however, has speeded up the development of the infrastructure services in other municipalities, notably Camaçari. It has been shown that 50% of the places of employment and 70% of the urban jobs registered in Bahia are concentrated in this area. Seventy per cent of the industrial investments made in Bahia during the last few years (1976 - 1979 approximately) were also made there.

Diagram No. 1/6 - Metropolitan Area of Salvador (RMS).

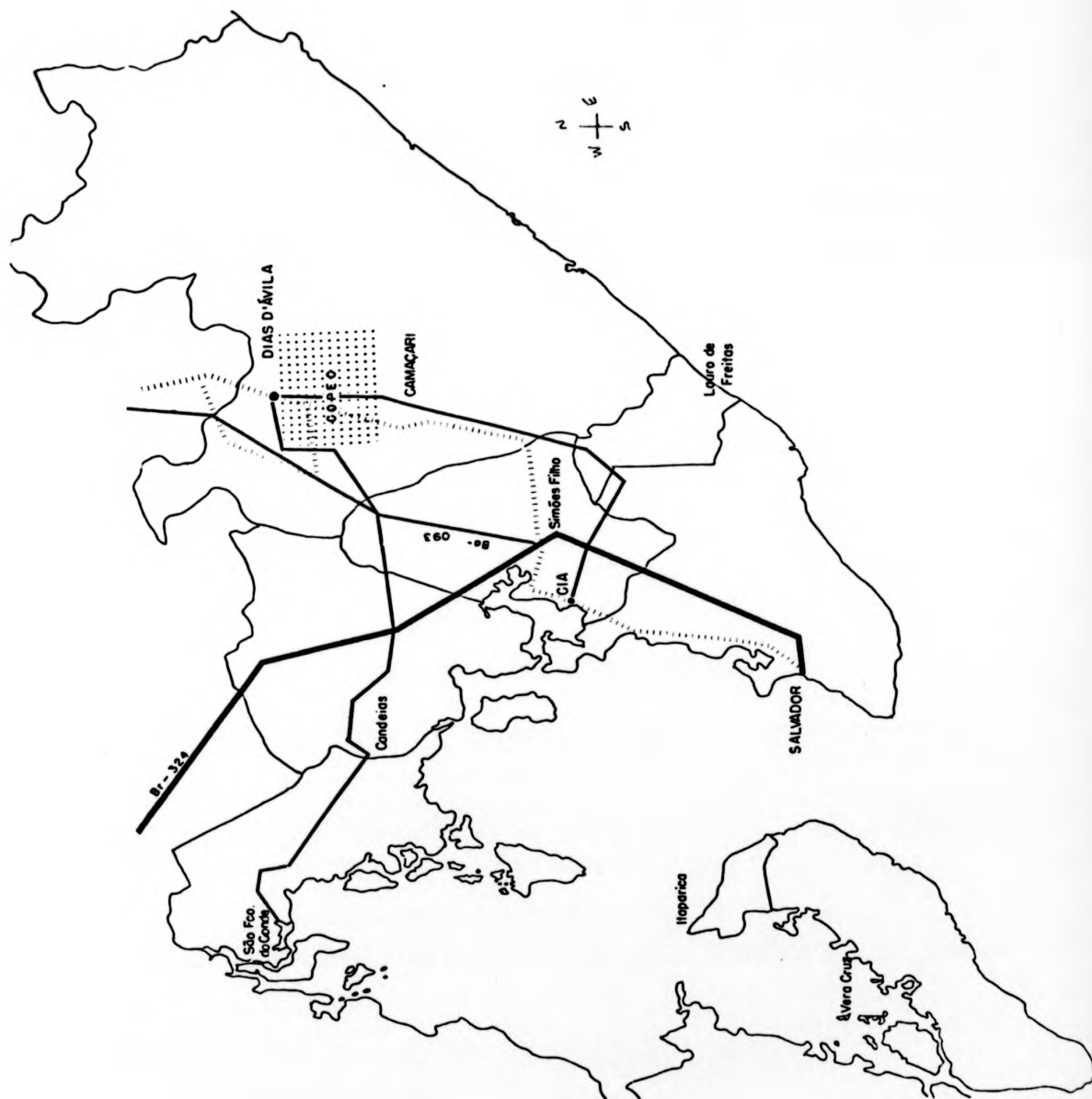
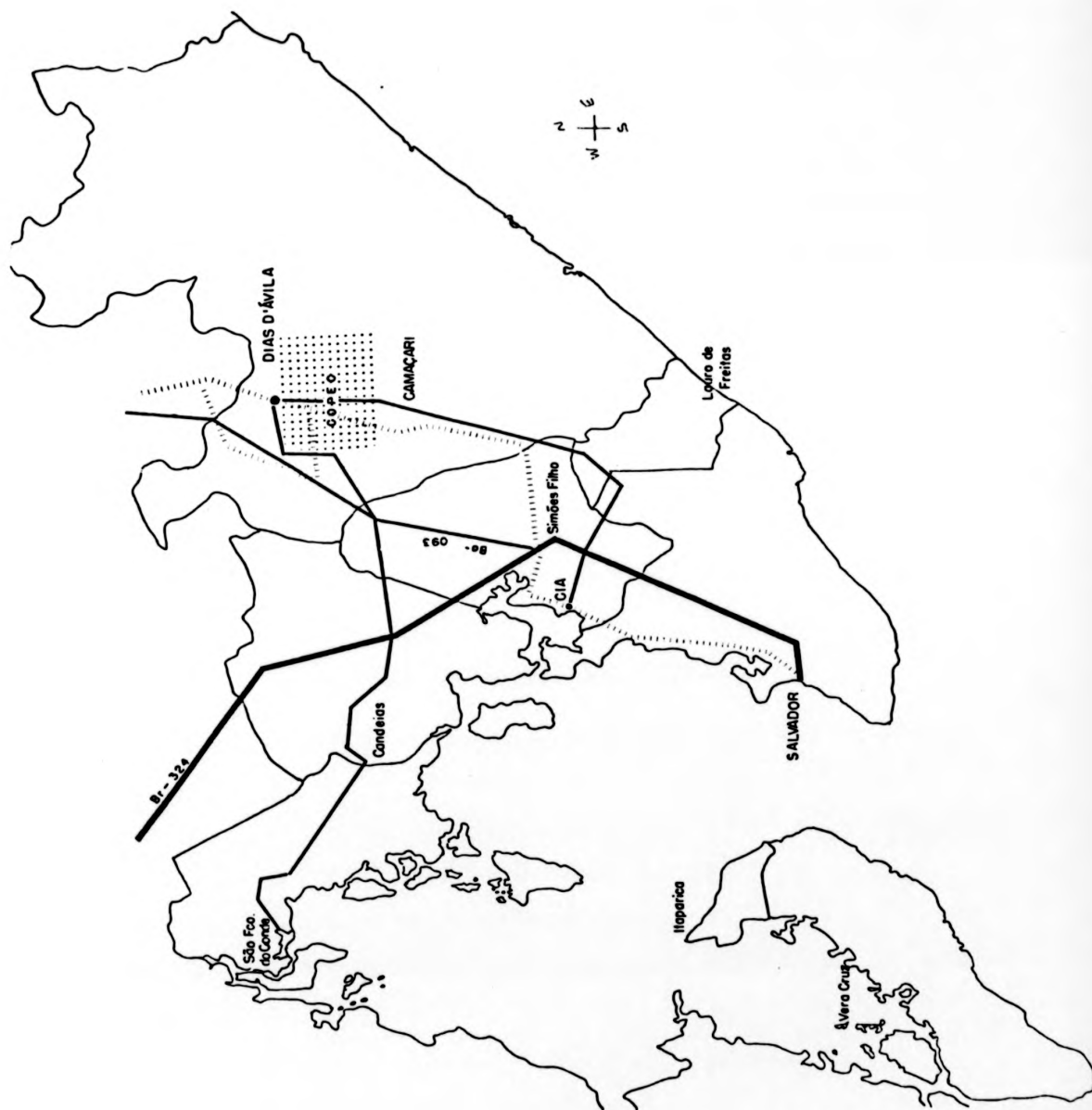


Diagram No. 1/6 - Metropolitan Area of Salvador (RMS).





This concentration means that the RMS is expected to be able to offer infrastructural support, general services and an industrial environment to the new activities which are being created as a result of the Camaçari Petrochemical Complex. Indeed, the area not only possesses to a sufficient degree of modern means of transport, basic services, communication facilities and electric power, but it also receives constant support from the urban centre of Salvador.

This vast metropolitan area is at an early stage of development, which can be seen as a two-fold problem. There is not a clear inter-connection and interdependence in the services or planning process of its municipalities. In a technical sense, then, Salvador is hardly a metropolitan area. On the other hand, we can admit that this early stage of development gives room for a more rational planning in the long run. Salvador does not have the congestion, pollution, and other bottleneck problems common to these large urban areas. It has also a greater potentiality for future expansion, with large areas of land available, that makes feasible an orderly organization of its economic functions.

#### I.4.1. Industrial Districts in the RMS

The first attempt at integrating planning in the RMS was the Aratu Industrial District (CIA), covering a part of the municipalities of Salvador, Lauro de Freitas, Candeias and the whole of the municipality of Simoes Filho (diagram n.1.6). This Industrial Centre is of great importance to the newcoming petrochemical pole. The industries already settled within its boundaries can be a powerful factor in attracting other firms, thus contributing to the setting up of new plants, as to process the petrochemical output of the pole or to supply it with services or even eventual feed-stocks. The CIA is therefore a locational option for industries directly connected with the petrochemical centre.

#### I.4.2. Petrobras Units

A further factor of special significance in the system of industrial support to the Camaçari Petrochemical Complex is the Landulpho Alves Refinery (RLAM) of Petrobras, located in the RMS (Sao Francisco do Conde), 35 km from the pole. With a capacity of 135,000 barrels a day, it is able to become the sole supplier of naphtha to the pole. RLAM has also an industrial complex composed of 16 units producing gasolines, kerosene (including aviation spirit), diesel, fuel and lubricator oils, paraffins, asphalt, solvents and propylene.

That refinery can pipe naphtha and gas oil to industries of the pole, and receive the petroleum derivatives, such as gasoline, oils, aromatics residues, pentane and others, which have their origin in the change-processing section of the petrochemical industries and which are not consumed by them.

Finally, the part played by RLAM in training specialised personnel in petrochemical processes must be emphasised, for it has put at the disposal of the petrochemical pole facilities for recruiting and training labour for the construction and operation of its plants.

#### I.5. THE MUNICIPALITY OF CAMAÇARI

The area of the petrochemical pole is wholly situated within the municipality of Camaçari, the largest in the RMS (962 Km<sup>2</sup>; diagram n.1/6).

According to the 1970 Census, Camaçari had at that time 33,273 inhabitants, with 60% of them living in the urban zone. The administrative district had 15,625 and Dias D'Avila, its biggest district, 5,187 people. With the exception of these two centres, the rural population was spread in other parts of the municipality, where the activities belong preponderantly to the primary sector. In 1974, however, nine large scale industrial plants were operating in the municipal area. They employed 4,225 persons and made

up a total investment of (225 million dollars): two belong to the chemical industry, four to petrochemical, two to the beverage and one to non-metallic minerals.

The primary sector has a significant proportion of the population in the area, whereas services depend almost entirely upon Salvador. Locally, services are concentrated in the urban areas of Camaçari and Dias D'Avila. The equipment for the social infrastructure of the municipality is at a low stage of development, especially in the domains of health and housing. Education is provided by the municipality and state. As for the health system, there are some medical and maternity clinics, although more serious cases are dealt with in Salvador. There are no National Health Service doctors or clinics, which means that those who have the right to public health benefits are obliged to go to Salvador to obtain them.

The low income level of the local community in contrast with the better financial situation of the floating leisured population, mostly coming from Salvador, is reflected in the clear-cut differentiation in the type of housing and even of social habits. Thus, middle and lower-class housing predominates in the case of occupants settled in the municipality, while the better built and more comfortable houses which stand out as being of the middle and upper-class type are, as a rule, those built for seasonal occupation by summer visitors, specially in Dias D'Avila. This town also has a fair number of hotels, including some of a high standard.

Table n.1.9. Population of the North East, Bahia, the RMS and the Municipalities that comprise the area in absolute numbers (000's).

Area	Population	
	1970	1975
North East	28,112,	32,032
Bahia	7,493	8,448
RMS	1,147	1,401
Salvador	1,007	1,237
Camaçari	33	40
Candeias	34	41
Itaparica	8	9
Lauro de Freitas	10	12
S.F. do Conde	21	25
Simoes Filho	22	26
Vera Cruz	12	11

Source: Census of Population - 1970, Anuario Estatístico do Brazil - 1976 - FIBGE.

Having discussed the general characteristics of the North East, Bahia, the RMS and Camaçari, let us look more specifically on the existing conditions of the population around Camaçari to analyze the quality of the human resources available to the industrial complex.

### I.6. HUMAN RESOURCES IN THE RMS

According to the data available, the population of the RMS show the following characteristics:-

- a. Fast growing metropolitan population;
- b. Young population on average;
- c. Low level of education;
- d. High centralisation in Salvador;
- e. Low percentage of the economically active population.

#### I.6.1. A fast growing metropolitan population

The 1,147,821 inhabitants of the RMS in 1970 represent less than 4% of the total population of the North East and less than 15.3% of that of Bahia. Compared to the population in 1960 (734,076), there is an increase of 59.38% (62.92% for the urban population). Salvador has grown at an average rate of 4.9%. If this trend continues that region will double its population in less than 15 years time. Theoretically, Salvador will have more than 2.2 million inhabitants in 1985. The estimated population in 1980 is around 1,800,000.

The total population however, is not the best indication for the study of the labour force potential in a region. Data for the economically active population, the age groups of the population, the level of education, migrations, etc., should be brought in for a better explanation.

Table n.1.10. Residential Population of Brazilian Metropolitan Areas in 1970.

Resident Population					
Metropolitan Areas	Absolute (000's)			Relative (%)	
	Total	Urban	Rural	Urban	Rural
Belem	656	606	50	92.4	7.6
Fortaleza	1,037	876	161	84.5	15.5
Recife	1,791	1,650	141	92.1	7.9
SALVADOR	1,148	1,077	71	93.8	6.2
Belo Horizonte	1,605	1,501	104	93.5	6.5
Rio de Janeiro	7,080	6,838	242	96.6	3.4
Sao Paulo	8,140	7,867	273	96.6	3.4
Curitiba	821	657	164	80.0	20.0
Porto Alegre	1,531	1,408	123	92.0	8.0

Source: FIBGE - Anuario Estatistico do Brazil - 1976.

Table n.1.11. Relative Growth of Brazilian Metropolitan Areas in the period 1960-1970.

Metropolitan Areas	Relative Growth of Population (%)		
	Total	Urban	Rural
Belem	60.61	60.70	59.47
Fortaleza	60.90	76.12	9.15
Recife	47.04	55.29	- 9.50
SALVADOR	59.38	62.92	6.98
Belo Horizonte	83.36	92.84	6.98
Rio de Janeiro	42.77	52.23	- 48.15
Sao Paulo	71.27	97.86	- 64.86
Curitiba	63.45	73.95	31.28
Porto Alegre	50.96	66.13	- 26.50

Source: FIBGE. Censuses of Population 1960/1970

Salvador does not have the highest growth rate for metropolitan areas in Brazil. Even so, an increase of 59.38% is very high for any city. Furthermore, the growth of the metropolitan area is extremely high if it is compared to the growth of the population of Bahia. During the period 1960/1970, the city of Salvador had a populational growth of 53.6%; the RMS - 62% and the municipality of Camaçari 12.3%. These growth rates are sufficient to create a lot of economic problems such as housing and employment shortages. This dynamism is due particularly to the balance of rural - urban migratory movements (table n.1.11 and 1.11.a). As the factors which attract the influx of migrants, who have been forced to leave the rural areas due to gross changes in production patterns or to droughts, are intensified in the present and near future, these strong growth rates tend to be kept up or even increased, notably with the implementation of the petrochemical pole at Camaçari.

Table n.1.11a Persons born outside the RMS by periods of living in the area

Census 1970

Time Living in the Area	TOTAL		MEN		WOMEN	
	Absolute	%	Absolute	%	Absolute	%
<u>Less than 1 yr</u>	42.	12.6	19.	12.7	23.	12.6
1 year	22.	5.4	8.	5.6	10.	5.2
2 years	22.	6.8	10.	6.8	12.	6.6
3 years	18.	5.4	8.	5.4	10.	5.4
4 years	14.	4.0	6.	4.0	8.	4.1
5 years	15.	4.2	6.	4.1	8.	4.4
6/10 years	55.	16.5	25.	16.6	30.	16.4
11 years	152.	45.1	68.	44.8	84.	45.3
Not known	1	-	-	-	-	-

Source: Sinopse Estatística do Brasil 1971

### I.6.2. Age Groups

Census data of 1970 and estimates for 1975 point out that the population of the Bahia State and that of its RMS is predominantly of young people. In effect, in 1970, out of the total population of the RMS 59.9% represented the under 25 bracket and 7.8% the 25-29 bracket. Thus, 70% of the population was under 30 years old. On the top of the age group pyramid, those above 60 bracket share only 4.7% of the total population. Approximately, one-third of the population is in the group 25-59, which is an encouraging figure for an industrial complex which employs highly skilled technicians. Even with more than 40% of the population out of the labour market, we have more than 550 thousand people within the working age, what is theoretically more than sufficient for any industrial programme at the proportion of that being built at Camaçari.

Table n.1.12. Resident Population of the RMS - 1970 by age groups.

AGE GROUPS	MEN	WOMEN	TOTAL	
			ABSOLUTE	%
0 - 4	88.	86.	174.	15.1
5 - 9	80.	79.	159.	13.8
10 - 14	66.	71.	137.	11.9
15 - 19	59.	71.	129.	11.3
20 - 24	54.	61.	115.	10.1
25 - 29	41.	48.	89.	7.8
30 - 34	35.	39.	74.	6.4
35 - 39	29.	34.	63.	5.6
40 - 49	43.	50.	93.	8.2
50 - 59	26.	31.	57.	5.0
60 - 69	14.	19.	33.	2.9
70 +	7.	13.	20.	1.8
Not known	1.	1.	2.	0.2
Total	544.	604.	1.148	100 %

Source: FIBGE, Census of Population 1970



The data available confirm that there is a potential labour force at the RMS, but only a study of other characteristics of this population such as its level of education, health etc. can indicate the real state of that labour force.

#### I.6.3. Level of Education

Tables n.1.13 discriminates the total RMS population by its level of education. According to the 1970 Census, the most disappointing figure was the 57.9% for illiterate and those with incomplete Primary School (first level of education). Table n.1.13a shows the figure for illiteracy (those who can neither read nor write) as being 26.5% which is still very high. Now if the population in the age group 12-14 is taken, only 29.1% has completed their primary school. Going up to those more than 25 years old only 13.4% has finished high school (second level) and 3.2% has achieved more advanced education. This percentage is even worse if the whole population above 5 is taken into consideration. Thus, less than 2.0% of this group has gone through a University course. These percentages are very low, notwithstanding representing 14,778 University leavers and 105,452 people with high and upper-high school certificates.

The master plan of the NPP found that the increase in educational opportunities in the period 60/70 was a relevant fact for an assessment of the labour force and training needs for any major industrial program at Salvador. In fact as the industrial basis of the RMS is very weak everything suggests that its qualifications and training of labour has kept up with the demand on the labour market. The manpower survey conducted by the Secretariat for Labour and Social Welfare (SETRABES) in 1967 showed that only an insignificant proportion of the economically active population engaged in industry had been recruited outside the state. Those recruited

outside were generally people with advanced qualifications. In the chemical industry, the manpower recruited in Bahia represented 99.4% of the total number of employees with only 0.6% coming from other states. This information, however, does not allow conclusions to be drawn about the present situation. It is possible that during the last years, the situation has changed with the advent of the large number of modern industrial plants. An analysis of the educational network system will put further light on the understanding of the capabilities of the region to supply the labour force necessary for the pole.

Table n.1.13 .Resident Population with 5 years of age or more by age groups and level of instruction in the RMS. (1970)

Age Groups	Level of Instruction	TOTAL		
		Absolute Numbers	within the age group %	% in relation to total
All Ages	Sub-Total Illiterate	258,076	100	33.5
12 - 14 years	Sub-total	78,768	100	10.5
	With Primary Instruction (completed)	22,908	29.0	3.0
27 years or more	Sub-total	431,020	100	56.0
	With Secondary school I }	57,729	13.4	7.5
	With Secondary school II }			
	With University (or similar ) degree	13,904	3.2	1.8
TOTAL		767,864	100%	100.0

Source: Censo Demografico 1970

Table n.1.14. Resident Population of the RMS over 10 years of age by levels of instruction. Census 1970.

Level of instruction	Total		Men		Women	
	Absolute	%	Absolute	%	Absolute	%
Total School leavers	343,619	42.1	167,222	44.4	176,397	40.2
Primary 4 years	223,389	27.4	107,422	28.5	115,967	26.4
Secondary I 4 years	56,775	6.9	29,060	7.7	27,715	6.3
Secondary II 3 years	48,677	6.0	20,810	5.5	27,867	6.4
University	14,778	1.8	9,930	2.7	4,848	1.1
Illiterate or with uncomplete Primary Instruction	472,001	57.9	209,553	55.6	262,448	59.8
Total	815,620	100%	376,775	100%	438,845	100%

Source: Sinopse Estatística do Brasil

#### I.6.3. (a) Educational Network System

Salvador has several centres for the training and qualification of that industrial labour with an output of 1,318 school leavers in 1970, including 1,075 skilled manual workers, 95 technicians of the secondary school and 148 professionals with University courses. By 1976, the output of the secondary school went up sharply to 1,100 while the number of those who reached more advanced courses remained steady. It should be noted here that these figures include only those professions directly related to the petrochemical complexes in its operation and maintenance needs, such as chemists, electro-, chemical- and mechanical engineers (SME).

Table n.1.15. Resident Population of the RMS with more than 10 years of age by levels of education in 1970 (000's).

Level of Education	Total	
	Abs.	%
Illiterates or with unfinished first level of education - (5 years schooling)	472.	57.9
Persons with complete Primary School (first level)	223.	27.4
Persons with the 2nd level of Education (9 years)	57.	6.9
Persons with the 2nd level of Education (12 years)	49.	6.0
Persons with University degrees	15.	1.8

Source: FIBGE - Sinopse Estatística do Brasil

As the pole was projected to create more than 15,000 direct jobs from which 70% (Waddams, Mercier and Delorme 1976) should be related to posts of operation and maintenance of the industrial plants, the output of the educational system network will not be very short of that figure if we consider the stock of unemployed people in the area. This latter group, however qualified they are, would require more training. There are hopes that the availability of jobs would increase sharply the number of people wanting to finish their formal education. The rate of drop-outs - in many courses it is around 90% - plus the continuous process of narrowing down the number of school leavers as we advance in the education pyramid are still a serious problem for the development of a suitable labour force in

the RMS. A suggestive example is described below:

Total population of the RMS in 1970	1,147,821
Persons who finished the Primary School (5 years)	343,619
Persons with 9 years schooling	56,775
Persons with 11 years schooling (secondary school)	48,677
Persons with University or similar degree	14,778
School leavers with technical qualifications related to the operation and maintenance of the petrochemical pole	243

Source: FIBGE - Census - SME

#### I.6.4. Economically Active Population

The 1970 Census shows that from the total economically active population of 355 thousand, over 55.5% had earnings less than CR\$200,00 and 20% earned less than Cr\$400,00 a month. This means that over three quarters of Salvador economically active population had very low wages.

Table n.1.16. Resident Economically Active Population with 10 years of age or more by monthly earnings (1970).

Monthly earnings Cr\$ (cruzeiros)	Total	
	Absolute (000)	Relative (%)
up to 200	197.2	55.5
201 - 400	72.9	20.2
401 - 100	45.0	12.7
1,000 +	21.8	6.1
Total including those without earnings and with no declaration of earnings	355.1	100 %

Source: Anuario Estatístico do Brazil, 1976 and Master Plan

#### (a) Job Ratios

The RMS population is mainly employed in the services sector (tertiary) and the number of jobs in the primary sector is negligible. The study on the distribution of jobs by the different sectors showed that the ratio of secondary plus tertiary sector jobs to total jobs was 95.57%, that is almost the totality of the employed people in Salvador is in these two sectors. The ratio of secondary to tertiary sector jobs was 41.62% which indicates the dominance of the service industry in the area.

#### (b) Skilled/Unskilled Labour Ratio

At first glance, it looks that the labour supply of unskilled workers in Salvador would offer no difficulty at all. Considering similar problems Hirshman (1958), Myint (1964), Baer (1974) suggest that shortage has influenced businessmen to opt for a capital intensive approach in the industrialisation program in developing countries. For instance, "the choice depends not only on two selected factors (labour and capital), but on a variety of other things, notably the third main factor - skilled labour. Many underdeveloped countries suffer from a greater shortage of skills than of material capital, so that they sometimes prefer more expensive machinery, which reduces repairs and maintenance, to cheaper or second-hand machinery which, although it might reduce the ratio of capital to unskilled labour, requires a larger amount of the scarcest factor, skilled labour" Myint (1964). Baer argues that the facilities to transform raw (unskilled labour) into skilled labour are limited (e.g. possibilities for on-job-training, vocational schools, etc), which makes the supply of skilled labour inelastic in the short run (Baer 1965).

Furthermore, skilled and unskilled workers alone are unproductive. What makes them efficient is the exact proportion skilled/unskilled labour any industry requires, that is to say that some skilled workers are needed for a given unit of unskilled workers.

Baer's argument was that in the supposition that for 10 unskilled workers we need 1 skilled worker and "if we have 100 unskilled workers in the economy and 5 skilled workers, the effective supply of unskilled workers is not 100 but 50" (Baer, 1965,p.99). On the other hand, if the number of skilled workers exceeded 10, the effective supply of unskilled workers would be 100.

Following those arguments, the effective supply of unskilled labour will probably be noticeably smaller than the absolute supply due to the scarcity of skilled labour. This would lead again to higher unemployment. As in the petrochemical industry the proportion skilled/unskilled labour is very high, this will reduce considerably the very demand of unskilled labour for the petrochemical units of Camaçari. This means that if the petrochemical industries could not manage to get skilled workers, they would not employ unskilled labour either. Thus, the effective employment of unskilled workers is also a function of the absolute number of skilled workers employed in the industries.

We can resume our arguments saying that the size of the unskilled population in the RMS does not mean effective labour for the pole, since the needs of the pole are for skilled labour and the ratio skilled/unskilled labour in petrochemical is very high (see chapter 3). As substitution of unskilled for skilled labour is difficult in petrochemistry and the tendency is for the substitution of technology for labour it is likely that the presence of this huge unskilled population will not affect the manpower structure of the industries. The employment of unskilled labour will surely depend on the amount and quality of skilled manpower for the pole.

### I.7. CONCLUSION

The extension of the region together with its infrastructure characteristics lend support to our claim that the North East is too big an area for an industrial complex localised at a single point in its territory to have a major impact on the whole region.

Even admitting that the North East is a logical location for the petrochemical industries due to the presence of raw materials and other mineral resources also used in petrochemicals, these industries are not complementary to the traditional economic activities of the area, the reason why their linkage network in the region is very weak.

Despite having around 32 million inhabitants, the North East has a population with low literacy, low income per head, low consumption and productivity, what is not an encouraging factor for large scale industrial projects. This population is having a process of fast urbanisation, specially with the growth of its three major metropolitan regions, making, then, employment and the creation of new jobs a dominant issue in the planning efforts. These facts will also exert pressure on the implementation of the basic petrochemical complex and on the transformation industry, based on petrochemical feedstocks.

In effect, the concentration of population and services seem to turn the RMS into an area theoretically capable of absorbing the establishment of a large scale industrial project. Furthermore, the presence of hydrocarbons on the spot makes this argument even stronger. More profound study of the available human resources, however, indicates that those supposed advantages are not so strong as they could appear at first sight. The RMS having little experience in this huge industrial developments, with more than 50% of its population under 20 years of age, a rate of illiteracy over 50% of the economically active population and less than 2% of it with higher education (University degrees), the prospects are for some difficulties



in relation to the human resources policies for that industrial complex.

These insights into the economic background of the region indicate that the pole must overcome these present weaknesses related to the poor supply of jobs, to its poor linkages with the regional economic activities and to the quality of the regional human resources, if it wants to be an effective tool for regional development and to attain its social objectives.

CHAPTER 2: INDUSTRIAL PLANNING IN THE NORTH EAST

## 2.1. INTRODUCTION

In the previous chapter, we were concerned with the environmental issues capable of having a straightforward influence on the development of the pole. Here we are dealing with successive attempts made by the region to coordinate those environmental issues, overcome the difficulties for its development and set a pace for industrial growth, which means that this chapter deals with the North East experience of regional planning.

When discussing this topic the following points have come out:-

- (i) First of all, we have introduced a discussion on growth pole theory to find out if the petrochemical industries are properly fitted to exert the role of a catalyst for the development of the North East. Can they create that wide network of linkages, an industry needs to become a pole?
- (ii) There have been different attempts for the industrialization of the North East, whose economic results are usually accepted as not being good enough to change the nature of the regional economic structure, notwithstanding having raised substantially the regional industrial output. Can these new policies for large scale projects make a break-through? On analyzing the 'Government action in the North East' our aim is to verify whether the present stage of large scale industrial project is a logical step derived from the development experiments in the region or an entirely new kind of venture?
- (iii) What kind of contribution can this new pole make to the regional development? How can it fit into its social objectives in practical terms?

Here comes the classical controversy over the role of business in society and its so-called social responsibility, a concept very often negatively

defined. It is thought, generally, that the social duty of business is not to cause further trouble to the community in which it is established, such as not to produce any kind of pollution, not to waste local resources with unfair use, not to bring more social or economic disruption into the community.

A positive approach would state that social responsibility deals with "the respect the" companies must show to the local community, and also with the provision of an effective contribution to the community and its standard of living. Writing about a well-known case of planning for an industrial growth pole - the iron-steel complex of Guayana - Friedman was very careful in advocating policies which could not only raise the economic production of the area, but also its general standard of living, its structure, customs, education etc (Friedman, 1976, p.210). The same is valid for Camaçari. We firmly believe that a major contribution the pole could make to the region is an improvement in the structure of human resources such as the raising of an entrepreneurial class in the area, an improvement in the general educational levels as well as the crafts and skills which could provide the population with wider employment opportunities. As these are major problems of the region, it follows that a defeat of those obstacles can be in fact a major achievement. The point is to verify if the pole is managed in that direction.

We are very conscious that these questions of social objectives are an endlessly discussed subject. We also acknowledge the existence of those who advocate that social objectives are for government not for business (Elliot, 1975). Even on this hypothesis, the NPP is a government headed project, whence we stress again our belief that the pole has social commitments which must be fulfilled, and must have a strategic priority.

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## 2.2. Growth Pole Theory

The expression was introduced by Perroux who defines growth pole as "centres from which centrifugal forces emanate and to which centripetal forces are attracted. Each centre being a centre of attraction and repulsion has its proper field which is set in the field of all other centres" (Perroux, 1950, p.27).

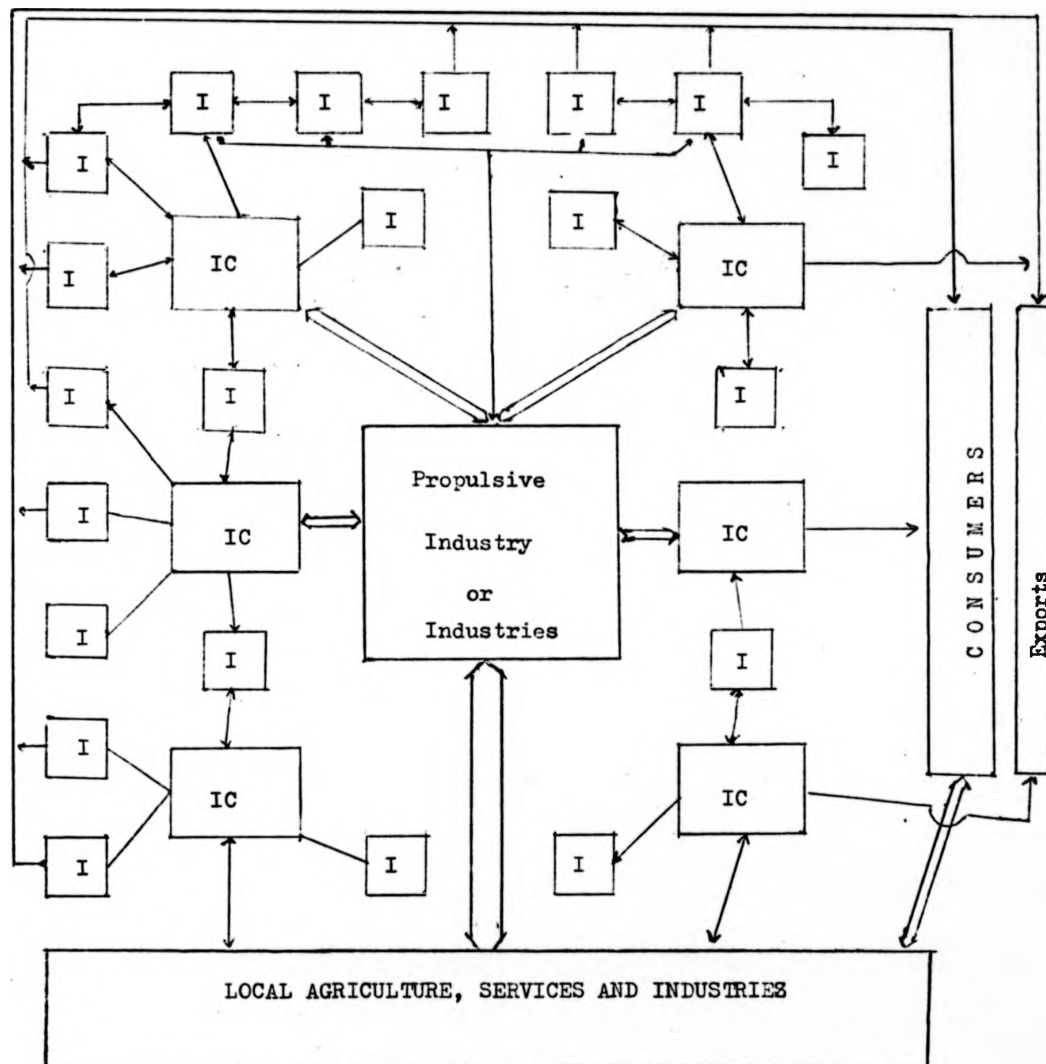
Later, geographers, economists and other social scientists have given the expression a geographical connotation. The initial concept, however, did not imply all these new variations of sense. As Darwent put it "poles are best regarded simply as sectors of an economy represented by an input-output matrix in which growth effects can be transmitted across the rows and columns" (Darwent, 1969). Growth in the matrix is directly related to the activity of the poles themselves, and also the degree of interconnection between them. A condition of 'dominance' of many firms by one firm (or of many industries by one industry) is an important feature of the growth pole notion. 'Dominance' is said to occur when the flow of goods and services from industry J to industry I is a greater proportion of J's output than is the flow from I to J of I's output. (Darwent). There is also 'dominance' when 'I has to buy raw materials to sell its products to J with no other option.

'The dominance is directly related to the size of the industry, since the bigger it is, the larger will be its field of dominance over other industries which sell to it or buy from it' (Darwent, p.6). Growth poles, then, are characterised by (a) larger size firm(s) that has (ve) a dominant role; (b) high degree of interaction with other firms and (c) a high level of innovations (Darwent 1969, p.6; Hermansen 1972). The rate of growth or change is directly related to the size of the industry. Perroux used the word 'propulsive' to express this dominance and leading role. This term indicates that the dominant industry is also capable of giving rise to other peripheral units to be placed under its shade.

A simplified scheme of the pole idea:

IC - Industrial Complex based on the propulsive industry

I - Other industries



↔ Flow of Goods.

As it is shown the propulsive industry is not designed to export its production, or to import raw materials, but to buy raw materials locally and sell its output to other industries, which can transform them for the local markets or for exports

Table No. 2.1:

Industry & Industry flow Matrix 1972.

Purchased by Industry	Sales by Commodity Groups.																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		
General Chemicals, Dyestuffs & Fertilizers	General Chemicals																								
	Synthetic Resins, Plasters Materials,																								
	Pharmaceutical Chemicals, Detergent, Toller																								
	Preparations and Soap.																								
	Other Chemicals																								
	Rubber																								
	Plastic Products																								
	Agriculture, Forestry, Fishing & Coal Mining																								
	Petroleum, Nat. Gas & Others - Mining and Quarrying.																								
	General Products, Sugar, Cocoa, Alcoholic Drinks, Tobacco, Oil & Fats & Other Food Products.																								
General Chemicals, Dyestuffs & Fertilizers	Coke Ovens, Manufactured Fuels & Mineral Oil Refining.																								
	Iron Castings and Iron Steel																								
	Aluminium & Alloys, Other non-ferrous metal, Ind. Plants & Steelwork, Office Mach.																								
	Construction Equip., Mechanical Engineering																								
	Electronic & Telecommunications, Domestic Elec. Appliances, Elec. Machinery, Insulated Wires and Cables, etc.																								
	Shipbuilding, Wheeled Tractors, Motor Vehicles, Aerospace Equipment, Other Vehicles.																								
	Engineers' Small Tools, Wire & Wire Man.																								
	Production of Man-made fibres, Other Textiles																								
	Leather, Leather goods and Fur clothing, Footwear.																								
	Building Materials, Timber & Furniture, Paper & Board, Paper Products, Printing, Publishing, etc.																								
General Chemicals, Dyestuffs & Fertilizers	Other Manufacturing																								
	Construction, Gas, Electricity, Water Supply.																								
	Railways, Road Transport, Other Transport, Communication, Distributive Trades:																								
	Misc. Services																								
	Total Intermediate.																								
	General Chemicals, Dyestuffs & Fertilizers	372.9	111.4	89.8	101.8	32.4	15.4	168.3	18.7	38.1	44.2	30.3	9.4	9.6	21.1	10.7	17.6	97.9	10.0	68.4	20.7	28.3	27.4	971.5	
	Synthetic Resins, Plastics Material, Synthetic Rubbers	6.5	(22.7)	2.7	21.3	25.0	101.6	2.6	1.4	23.1	0.7	1.9	0.8	5.2	28.6	3.7	5.1	48.7	6.5	34.3	18.7	1.4	3.0	342.8	
	Pharmaceuticals Chemicals, Detergents, Toilet Preparations and Soap.	6.7	2.2	(94.0)	3.6	0.4	0.3	8.8	0.4	31.4	0.5	0.5	0.2	0.8	0.5	1.0	0.8	4.2	0.7	3.9	0.9	2.4	111.6	82.0	
	Other Chemicals	5.0	2.2	3.5	(14.5)	1.1	3.5	20.9	7.1	10.3	0.3	5.2	4.9	21.9	7.7	29.4	13.7	2.3	5.0	79.5	3.5	59.7	58.4	346.8	
	Rubber	3.7	0.9	1.0	2.6	(21.6)	2.6	18.5	1.4	9.2	0.5	7.7	2.4	22.7	15.3	100.9	10.6	12.9	12.2	13.6	2.9	9.9	147.2	398.8	
Plastics Products	14.0	1.9	29.1	13.6	1.9	(22.2)	2.1	0.7	39.8	0.6	8.7	5.7	15.1	57.7	76.6	20.3	9.4	12.1	25.4	11.5	58.8	65.0	469.4		
TOTALS	Intermediate of the above six rows	35.9	118.6	126.1	142.9	60.8	123.4	344.6	29.7	151.9	46.8	54.3	23.4	75.3	130.9	222.3	522.6	175.4	465.0	225.1	58.2	160.5	412.6	2,711.3	
	Total Intermediate for all Commodity Groups.	652.6	256.2	480.8	362.1	224.3	276.6	1,642.1	211.8	3,946.7	420.6	1,108.5	859.8	1,640.6	1,475.1	2,140.0	1,251.1	931.5	672.8	9,324.5	215.9	4,140.6	5,835.2	31,076.7	

Source: Business Monitor - U.K., 1972. (Table D).

This table shows the intimate relationship between chemical industries (petrochemical) and all other sectors. This backs the idea that the petrochemical industries can, in fact, play the role of a growth pole.



There are industries which lie perfectly on the Perroux's concepts. A good example is the chemical industry that buys its inputs mainly from other industries and sell its output to different manufacturers. The industry versus industry matrix relates the relationships between six kinds of chemical industries (General Chemicals, Dyestuffs and Fertilisers, Synthetic resins, Plastics Material and Synthetic Rubber, Pharmaceutical chemicals, detergents, toilets preparations, soap, other chemicals, plastic products) to all other industries in a developed economy. That gives a clear idea of all the linkages that can be drawn from a chemical industry. As petrochemicals account for over 90% of the chemical industry we can interpret that industry x industry matrix as an indication of the value of the petrochemical pole idea. Petrochemical industries can in fact form a growth pole in Perroux's sense (tables n.2.1. and 2.5.). In fact, Perroux finds that petrochemical industries had the required characteristics to be a growth pole in France at the time of his studies (Perroux 1968, p.243).

#### 2.2.1. Literature on Growth Poles

An advantage of the large literature on growth pole is that it covers both developed and underdeveloped economies, industrial and non-industrial projects. In fact, Perroux used the chemical dye industry and its close relation to textiles in Lyon to explain the development of peripheral units in small towns and rural areas in France with the appearance of new petrochemical industries as well. Aydalot commentated that the gas resources in Lacq in South West France created an expectation of development, but no major change occurred since the gas was used basically for heating and for other uses outside the area. There was, however, an industrial enclave around the gas prospective area. A relatively successful experience with growth poles one of which is based on the petrochemical industry can be seen at Huelva in Spain (Lasuen 1967, 1969, 1973).

Many researchers point out, however, poor results of growth poles in different areas throughout the world: Mosely (1976) - rural areas of East Anglia/England and Brittany/France; Misra (1973)/India. Katzman(1976) & Boudeville(1957)/Brazil, Mabogunje (1971)/Nigeria & Friedman(1966) proposes a different but similar model (Centre-Periphery) in Venezuela, while Coraggio sees a need to revise the theory.

Anyway, by the time the Brazilian petrochemical poles were founded, studies on growth poles had already achieved an advanced stage. What is left to be known is the extent to which the policies adopted could turn the NPP in to a real spring of development for the whole North East region.

### 2.3. GOVERNMENT ACTION IN THE NORTH EAST

#### 2.3.1. The North East and Brazil Development

The North East has been running behind Brazil in terms of growth and development, as it was explained in the previous chapter. This may be attributed to several reasons, and efforts of different kinds were endeavouring to solve that problem. Besides the respective actions of each one of the State Governments, the Federal Government had also adopted a series of measures to counterattack that unbalance. Those measures can be summarised by the specific behaviour of the government bodies, specially created for that purpose. They are the DNOCS, a national agency for works against the droughts - the CHESF - the hydro-electric company of the River Sao Francisco, the CODEVASF - the Development Company of the Sao Francisco Valley, the SUDENE - a federal agency for the development of the North East.

#### 2.3.2. Drought Control

Since the last century, the Government took action directed to control the effects of the droughts, with policies of supporting to those scourged by their effects. Afterwards, they began the building of engineering works,

such as dams, wells, roads to retain water at the area and to improve communications. These works had, at least, the effect of providing jobs for thousands of unemployed peasants left without jobs as a consequence of the long droughts. These government actions remained through the years and the government used to open several works, generally roads and dams, to provide jobs for those people up to the present time. The DNOCS, then, the Government Agency responsible for the implementation of those policies, is frequently identified as a body of large projects, that seldom produced important results as to control the effects of droughts which still occur. Its works, however, provide temporary relief for the sufferings of thousands of people, that, otherwise, would probably join other migrants to the littoral towns.

### 2.3.3. CHESF and CODEVASF

The next two Departments - CHESF and CODEVASF - are an attempt to develop the River Sao Francisco, that cross the State of Bahia just on its arid region and also to build an hydro-electric dam (Paulo Afonso) to produce energy to the whole North East. Many people, today, attributed to Paulo Afonso the start of industrialization in the North East. In fact, Paulo Afonso is a huge dam, built on rocks of a waterfall, producing electricity and serving together with other small hydro-electrics the whole of the North East region and other places. It solved the problem of energy making possible the implementation of industrial plans at the region. The RMS receives its energy from Paulo Afonso that has a special line to Camaçari. CODEVASF was responsible for all other works at the San Francisco,, apart from energy, with a role of functions very similar to that of the TVA in the United States. However, both CHESF and CODEVASF due to their large scale projects have had indirect effects on Camaçari. We will come back

to this point again later on when dealing with migration to Camaçari.

The most influential bodies for the North East development are, however, the BNB (the Bank of the North East) and SUDENE. These are units founded with the specific purpose of promoting development.

#### 2.3.4. The Bank of the North East (BNB)

The BNB (Banco do Nordeste do Brasil) was also an Institution created to control and to manage a national fund against the droughts, but with a philosophy that went beyond the limits of engineering works to make a whole economic appraisal of the region. That is one of the reasons why it grew to be a leading bank in Brazil today. At the beginning, it used funds coming from the Central Government - the Constitution of 1946 reserved at least 3% of its tax income for socio-economic assistance investment in the North East. That was abolished and the bank was, then, object of different policies of the Central Government. Today, the main source of funds come from the Central Government and from a system of tax incentives given to companies wanting to settle at the region and also to individuals wanting to apply part of their income tax - that otherwise they would be obliged to pay to the Government - to projects located in that region. This system is called 34/18, named after the number and paragraph of Law and afterwards FINOR. Some companies of the pole and other consumer-end industries received funds from that system.

#### 2.3.5 SUDENE

Sudene (Superintendencia de Desenvolvimento do Nordeste), created in 1959, was the logical result of all the economic development efforts made before. In fact, the Government had already perceived the enormous problems of the North/South gap in Brazil, and much more than an agency to fight drought effects and an official bank to transfer Government expenditure at

the region was needed.

#### (a) GTDN's Proposals

By the end of the 50's, the first global and persistent attempt to analyze the peculiar relations between the North East and the rest of Brazil was made. A group (GTDN) produced a paper where the whole North East problem was discussed, its origins identified and solutions proposed. The GTDN searched for possible solutions to the stagnation of the region and proposed a package of policies in which the role of planned industrialization was stressed to counterface the inefficiency of the indigenous and traditional industries. It suggested the creation of an autonomous centre for the expansion of industries through the increase of industrial investments. The stated objectives of those industrial policies were the absorption of great number of unemployed and underemployed people in the newly created manufacturing jobs. The strategy to achieve those objectives was the reorganisation of the whole industrial sector of the region, the rationalisation of business methods and the creation of new companies with modern management techniques. The GTDN work, however, did not specify the means to achieve the new managerial power necessary for that task. The installation of an industrial park by its own would not have been sufficient for the upsurge of a new managerial class, well suited for the management revolution the region needed.

#### (b) SUDENE's Master & Development Plans

To deal with the proposals put forward by the GTDN study, the Federal Government reorganised the structure for the North East, created the SUDENE and gave it the responsibilities of carrying out GRDN's suggestions and of producing general plans for the social-economic recovery of the region. During the sixties, Sudene produced four Master Plans and two development plans (table n.2.2) but where the policies defined by GTDN were never fully observed, according to Albuquerque (1976) Goncalves (1978).

Table n.2.2. Use of Resources in Sudene's Master and Development Plans (%)

PROGRAMS & SUBPROGRAMS	SUDENE'S MASTER PLANS				DEVELOPMENT PLANS	
	61/63	63/65	66/68	68/70	1972/74	1972/79
Infrastructure	60.9	49.4	37.4	37.5	28.9	8.8
Social Services & Community	13.5	22.0	29.9	23.3	19.8	41.7
Natural Resources	7.9	9.3	7.8	9.6	1.7	0.2
Primary Activities	14.4	14.1	17.9	20.5	17.5	9.8
Colonisation	1.9	1.7	1.6	1.9	28.5	0.4
Industry	1.4	3.0	5.4	5.4	3.3	29.7
Others	-	0.5	-	1.8	0.3	9.4
TOTAL	100%	100%	100%	100%	100%	100%

Source: Sudene - Planos de Desenvolvimento em Albuquerque, p.73.

Ever since the first plan, Sudene has come through many difficulties especially the lack of sufficient funds to carry out its mission, particularly after the reorganization of the Federal system of planning. The funds originally destined to Sudene were progressively diverted to other purposes with the respective losses for the NE regional programs. That means that economic resources that should be normally be used at the North East were applied in other areas. This technical problem has been constantly denounced at all levels, but it seems that there is no political will to solve it.

#### (c) Appraisal of SUDENE'S Performance

The proposals made by the GTDN - industrialization, reorganization of the rural sector, and training and formalism of skilled labour are well believed to be valid up to now. That leads us to think that the problem of the NE is not exactly

a lack of knowledge of effective technical solutions to the problems of the region, but the inability of the Government to take the right decision. What happens is that Sudene is only an Agency dependent on the whole structure of the Government. A lot of criticisms that were made of its performance in the North East can be understood in the light of the whole government structure. The criticisms were made at many grounds:

- (i) that it overstressed the role of industries at the expenses of agriculture;
- (ii) that it helped the swelling of the two biggest North East conurbations - Recife and Salvador;
- (iii) that the industries it created did not provide many jobs for the unemployed and underemployed workers as was envisaged in the GTDN plan.

#### 2.3.6. New Approach to Planning in the 70's

##### (a) New Planning Policies

In the seventies, the Federal Government opted for different approaches for the development of the North East. The Secretaria do Planejamento (Secretary for Planning and Economic Coordination, a national body at the Ministerial level) centralised all regional plans in Brazil. The decline of SUDENE at that time was evident. It continued to exist, but with less power and responsibilities than hitherto. This shift of policies was intended to centralise in only one Agency all the decisions of regional development, its main programs and investments. The regional Agency became an operational unit to carry out the policies decided by the central government. The autonomy of SUDENE and other similar Agencies was removed. Planning was again back to the Central Government, releasing SUDENE from its main tasks for which it was created.

### (b) Large Scale Projects

Two factors of particular importance for the region were introduced in that change of policies. The first was the reorganisation of the whole Brazilian Planning System, with centralised units (Secretaria do Planejamento) and Regional Agencies for the implementation of Central Plans. The second one was a new association of the Government with large scale project ideas. It was thought that the concentration of economic resources into special sectors would promote the regional development plan. The second PND (National Development Plan) is full of references to those programs and the government again gives priority to the industrialization of the North East. The NPP is only a part of the Federal Government strategy for the North East.

At the time of the first Master Plan of the pole, beginning of the Seventies, there were hopes that the region was recovering from that long decline due to the new government industrialisation plans. The region has benefited from the mechanism drawn to the transfer of industrial investment into the area. The economy had an average rate of growth of 6.82% from 1960 to 1970, which was a little better than the Brazilian performance as a whole. That growth has been attributed to the development of the industrial sector, which has grown much faster than the nearly stagnant agriculture. Since 1968, however, the pace of growth of the North East had slowed again (Table 1.2, diagram 1.3). The new idea at that time was to give industries with strongly vertical and horizontal linkages, such as petrochemical, top priority to settle down in the area.

### (c) Appraisal of Industrialisation Policies

There is no doubt that the arrival of those industries has brought new blood to the industrial sector in the North East (see 1.2.2 and 2.4). The problem now seems to be the ability of the present management to expand those



plants and to set up the broad linkages the government want to create. There is also no doubt that the tax on the output generated by those industries will boost the regional budgets (see Chapter 6.5). The availability of financial resources, on the other hand, will not be sufficient for the social objectives of the installation of the North East pole. The presence of industries about does not mean development. Development requires a reduction in the level of poverty, better distribution of wealth, while these new industries may result only in the increase in production and productivity due to its nature. Large scale industrial projects do not lead necessarily to a self sustained manufacturing economy and the growth of the revenue derived from tax collection has proved an inefficient instrument to tackle the problems of inequality between different regions of a country.

A parallel project on the development of the local human resources is an essential task to drive those industrial projects into a healthy business structure. That would require much more effort from the Government than the single establishment of the pole.

In the Master Plan of the NPP, it was emphasised that the way to close the regional gap in Brazil could be achieved only if "the industrial sector continued to expand and if it achieved the necessary transformation of its production structure". Concern with employment or with other socio-economic conditions are not as strong as the emphasis on production. At that time, the objective was to keep an overall economic growth rate above 10% for the region, while Brazil was running at a 9% increase. It argued also for a fast urbanisation process in the region which will certainly require a broader development of industries.

The Master Plan did not mention how the complex could be of benefit to that fast regional urbanisation, especially, realising that the pole would be settled at a single point of a vast region. Anyway, the option for those big projects were made and based on the hopes of a major contribution for

the regional development.

## 2.4. INDUSTRIALISATION POLICIES FOR THE NORTH EAST

### (a) Periods

The industrialisation process of the North East according to Gonçalves (1978), can be divided in four periods.

- (i) Traditional industries that precede the planned industrialisation program of BNB and SUDENE; before 1960.
- (ii) Modernisation of the traditional industries - just after the creation of Sudene; 1959 - 1965.
- (iii) New industries - small and medium units in their majority; (1965-70).
- (iv) Large scale industrial complexes that is the present program: present

The evolution of North East industries from 1949 to 1974 is given at table n.2.3. There we can see very easily the dynamic sector of industries had grown faster than the traditional one. That indicates a little success in terms of bringing new industries into the area. In our case, it is of real importance the growth of the chemical industries from 5.6% in 1949 to 18.6% in 1974. Their growth after 1974 is even higher due to the installation of the complex at Camaçari.

### (b) Industrial Complexes

Some of these new industries came in just to take advantage of the incentives, but did not have any other linkages with the area, being completely dependent on the will of their parent companies in other regions. It is not surprising that their rate of close-downs was quite high. That is one of the reasons why Government policies change at the region to back the installation of industrial complexes, instead of single factories. It was supposed that the advent of integrated complexes could

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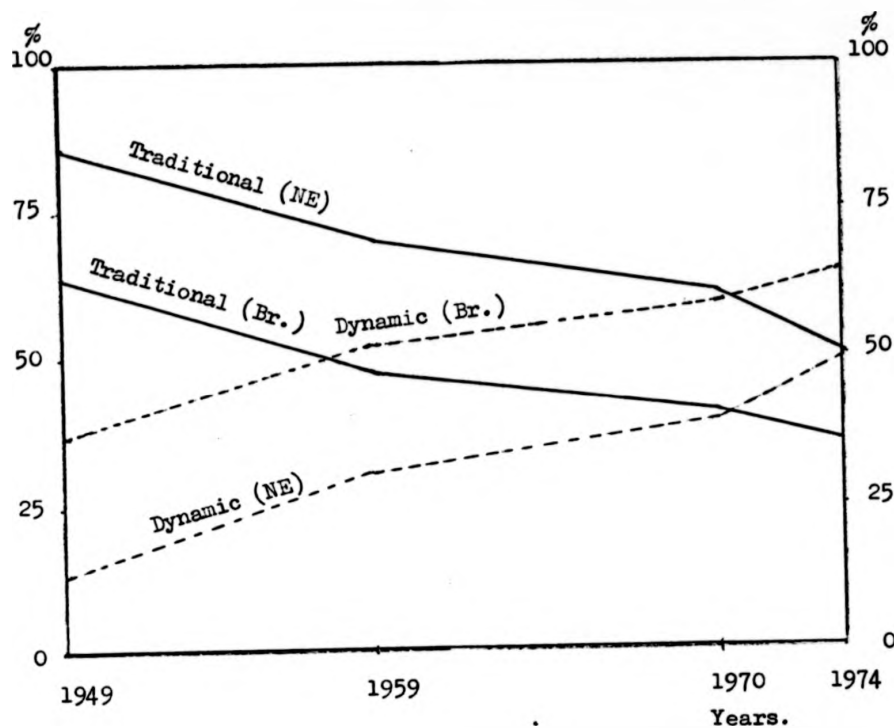
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Table n.2.3. Relationship between the traditional and dynamic sector of the transformation industry (%)

Industry	1949		1959		1979	
	NE	BRAZIL	NE	BRAZIL	NE	BRAZIL
<b>Traditional</b>	86.5	63.9	70.0	47.4	50.2	35.4
1. Food products	37.8	20.5	29.7	16.3	21.0	10.5
2. Drinks	3.2	4.4	3.0	2.9	3.0	1.8
3. Tobacco	2.3	1.4	3.1	1.3	1.1	1.1
4. Leather, Furs & diamonds	2.0	1.3	2.3	1.1	0.4	0.5
5. Textiles	35.3	19.7	24.1	12.0	15.6	7.3
6. Clotheswear, footwear	1.8	4.3	2.2	3.6	3.8	3.5
7. Timber	1.1	4.3	1.7	3.2	1.5	3.2
8. Furniture	0.6	2.2	1.6	2.2	1.0	1.8
9. Paintint & graphic arts	2.1	4.0	1.9	3.0	1.9	3.2
10. Others	2.3	1.9	0.4	1.8	0.9	2.5
<b>Dynamic</b>	13.5	36.1	30.0	52.6	49.8	64.6
11. Non-metallic minerals	5.3	7.2	8.1	6.6	8.0	5.3
12. Metallurgy	1.7	9.4	2.0	1.7	9.7	14.5
13. Mechanical	0.2	2.1	0.2	8.4	2.9	9.1
14. Electrical material & communication	-	1.6	0.2	4.0	2.6	5.7
15. Transport material	0.2	2.2	0.8	7.6	0.9	7.1
16. Paper and cartons	0.5	2.3	1.7	3.0	3.1	3.7
17. Rubber	-	1.9	0.3	2.9	0.5	1.8
18. Chemical			14.9	8.6	18.9	1.2
19. Pharmaceuticals & veterinary			0.3	2.5	0.3	2.4
20. Perfumes, soap & candles	5.6	9.4	1.4	1.4	0.7	1.2
21. Plastic material			0.0	0.9	2.2	2.6

Source: FIBGE Census Industries (1950, 1960)  
Industrial 1974 in BNB v.10(2) p.286.

Diagram N. 2/1 - Evolution of the dynamic and traditional industries  
in Brazil and in the North East. (%)



Source: Table n. 2/3

The diagram shows that the evolution of the dynamic industries was more accentuated in the NE (49.8/13.5) than in Brazil as a whole (64.6 / 36.1). By 1974, the dynamic sector had approximately 50% of the value of the industrial production in the NE.

put an end to the isolation of industries that were forming into the region. Those complexes had theoretically the capability to bear new industries that would be aggregated to them in a manufacturing web , in the form of growth poles. It remains to be known the extent to which those larger scale industrial complexes would be strong enough to grow and spread roots in the area, to make a broad network linkages of industries.

These industrial complexes, however, would not solve the other criticisms made of the industrialisation proposed by SUDENE or by the Brazilian Planning Authorities, namely, the lack of jobs and the development of the region. In fact, the tax incentives system by reducing the cost of capital was conducive to the establishment of industries which used the very scarce factor of the region rather than industries which might use the excess of labour, and thus contribute to a positive socially responsible policy.

#### (c) Tax Incentives

With some changes during its history, those incentives were mainly an allowance given by government to firms and afterwards to individuals consisting of an reduction in the income tax to those wanting to invest in the North East. As the amount of investments grew, the pressure to extend the system to other areas increased at the same proportion, making the North East lose the exclusivity of those incentives. The results were a drastic reduction in the amount of investment that has directly affected the availability of money for the industrial complexes in the region.

In this situation, it is easy to understand Sudene's claims that it has not done more because of the lack of financial resources. Furthermore, part of those meagre funds were allocated at the industrial complex at Camaçari, that is a national rather than a purely regional priority. Other poles such as the one being built in Rio Grande do Sul is being made with Federal and private resources. Without discussing the right and wrong of the application of Sudene's funds at Camaçari, one may admit that it

diverted resources from other priority areas to Camaçari, whence the responsibility of that complex to extend its benefits beyond the frontiers of the Municipality and to the State of Bahia and the whole North East is even higher.

Table n.2.4. Evolution of the Tax Incentives by areas of Application (%)

Year	North East	Others
1962	100.00	-
1964	91.8	8.2
1966	82.9	17.1
1968	64.5	35.5
1970	54.0	46.0
1972	24.1	75.9
1974	23.9	76.1
1976	21.8	78.2

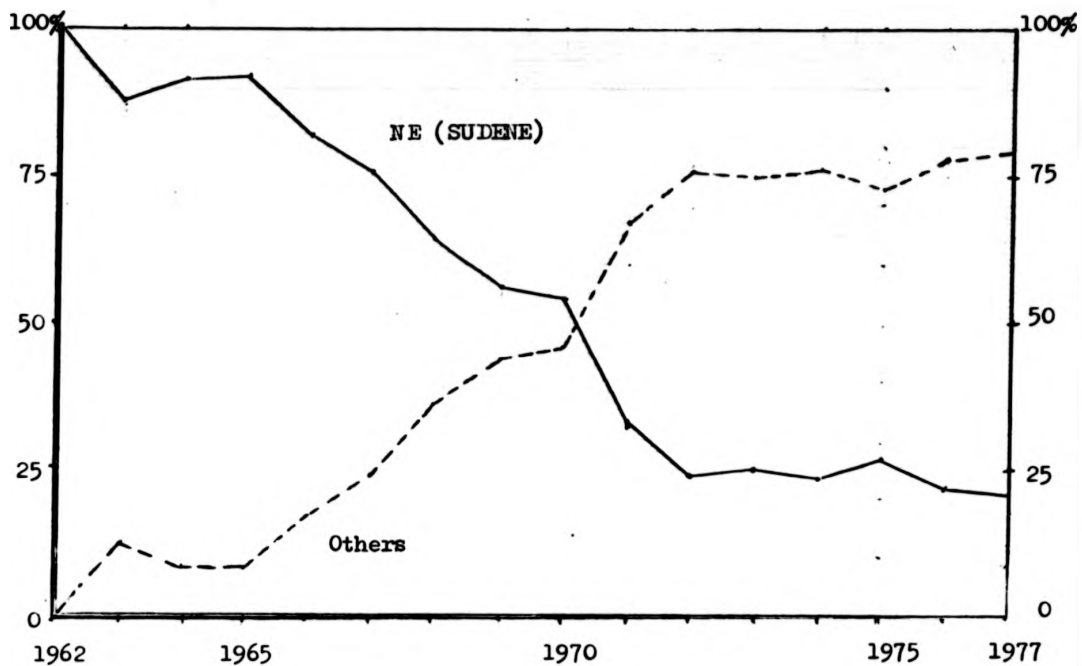
Source: Revista Econ. Nordeste, vol. 10 (2)

#### 2.4.5. Large Scale Industrial Policies in the North East

##### (a) Managing large scale industrial complexes in undeveloped regions

The management of a large scale industrial project such as the NPP would certainly raise the question of the first priorities of business. Should those complexes be developed as competitive units in conditions not only of supplying the region with petrochemical products but also of facing competition in other markets and from other industries outside the area? How can this be achieved without endangering the stated development of the region badly needing more jobs and more even distribution of wealth?

Diagram No. 2/2 Distribution of the Tax Incentives originally scheduled  
for the NE.



Source: CIEF/MF in Rev. Econômica do Nordeste, v.10(2).



It is churlish but also frequent for industrial companies going into development areas to forget the original objectives for which they were created. There surely must be two-fold conditions to obtain those objectives - a favourable environment as discussed in the previous chapter and a management purpose to accomplish them. It would be an economic illusion to create poles where non-appropriate environmental conditions exist: it is also unreal to set up social objectives where the management of the project is not determined to pursue them.

Managerial staff very often identify themselves with "profit" that seems to be a key word to measure management success or failure. If that is the case here, it is a unfavourable behaviour in these large scale projects for underdeveloped regions, at least, in the short run.

#### (b) Social Objectives in large scale Projects

In fact there is a general and wide acceptance of the social values of business in modern society. Nowadays, nearly all the management literature suggests a list of social objectives for business. But, in practice, those objectives are very often forgotten. They work better in theory than in practice.

This controversy is very high whenever in underdeveloped regions the government decides to invest in massive industrialisation. Generally, there are three streams of opinions:

- (i) Those who advocate a subordination of the company profitability to attend other objectives for which they were created;
- (ii) Others opt for a strict rationalisation of the company leaving the social problems for the government to decide;
- (iii) Others want a certain type of compromise and suggest a system of a common fund whereby they and the government can subsidise the costs of labour.

This discussion goes deep into the nature of business, where some managers adopt a line similar to that supported by the management by objective philosophy (Drucker, 1964, Humble, 1970). Others simply neglect that, at least in practice. A different approach to this problem has been put forward by managers of those complexes. The argument is that the basic industries in the pole should be as profitable as possible and they should be managed in strictly rigorous business strategy, very profit-conscious, and well rationalised. It is argued that they should be managed in this fashion, because they are 'propulsive' industries in Perroux sense, needing a high level of efficiency not to pass excessive costs to the peripheral units to be created. So, if the basic industrial complex fails, all other satellite industries would go with it. These satellites industries, however, could provide jobs, linkages and the integration with the local community.

Reasonable as it appears to be at first glance, this argument fails in three grounds. Firstly, every single industry has to be immersed in the community and responsive to its needs and not transfer this responsiveness to other industries or customers. Secondly, they have received incentives and government help and so, indirectly, public money and thirdly, the arrival of satellites industries is only a possibility and not a reality in Bahia. In fact, the percentage of the pole output that is processed in Bahia does not reach 10% (see 3.93).

#### (c) The North East Petrochemical Pole (NPP)

The NNP has potentially all the characteristics a growth pole should have (see 2.2). The only straight forward difference is that, instead of a propulsive industry in the Perroux's concept, there is a propulsive complex, i.e. a group of firms closely linked together for the production

Table n.2.5. Structure of the demand for intermediate goods by selected industries in the State of Bahia (Ct\$1,000) (including only industries that used government incentives - project 34/18 - to come into the area).

Intermediate Goods	Metallurgy	Mechanics	Electrical Material	Transport Material	Chemicals	Plastics	Textiles	Clothes & Footwear	Total Purchases Manufacturing Goods
Metallurgy	9,440.3	7,047.3	31,018.0	5,231.5	1,291.4	5,742.9	16.3	1.1	66,931.5
Mechanics	0.1	3,396.2	11,320.2	35.2	-	-	-	-	4,787.8
Electrical Material	540.0	4,830.2	3,079.4	1,367.7	-	100.5	-	-	9,923.5
Transport Material	-	-	-	38,057.6	-	-	-	1.6	38,081.5
Chemicals	2,759.6	639.9	751.3	318.0	28,978.0	2,946.3	2,155.4	544.7	61,632.8
Plastics	2.7	-	133.5	250.7	37.6	4.8	-	18.4	734.0
Textiles	12.1	-	131.6	-	643.9	9.2	15,673.9	4,727.9	22,666.1
TOTAL	13,713.2	17,684.3	44,803.9	48,803.9	33,783.3	8,865.3	18,002.6	6,279.0	258,236.1

Source: IPEA/SUDENE in Goodman & Albuquerque

of different petrochemicals. The NPP also satisfy Hermanson's definition of industrial complex "as an ensemble of technologically interconnected industrial units usually located on a given territory".

From a study based on the firms which set up branches in the state of Bahia using the tax incentives given by the government, there is an input-output table that indicates close linkages between the chemical segments of an industry with other sectors of the economy (table n.2.5). This table indicates only relationships between different kinds of new-coming industries which, on its own, does not mean their integration to the regional economy.

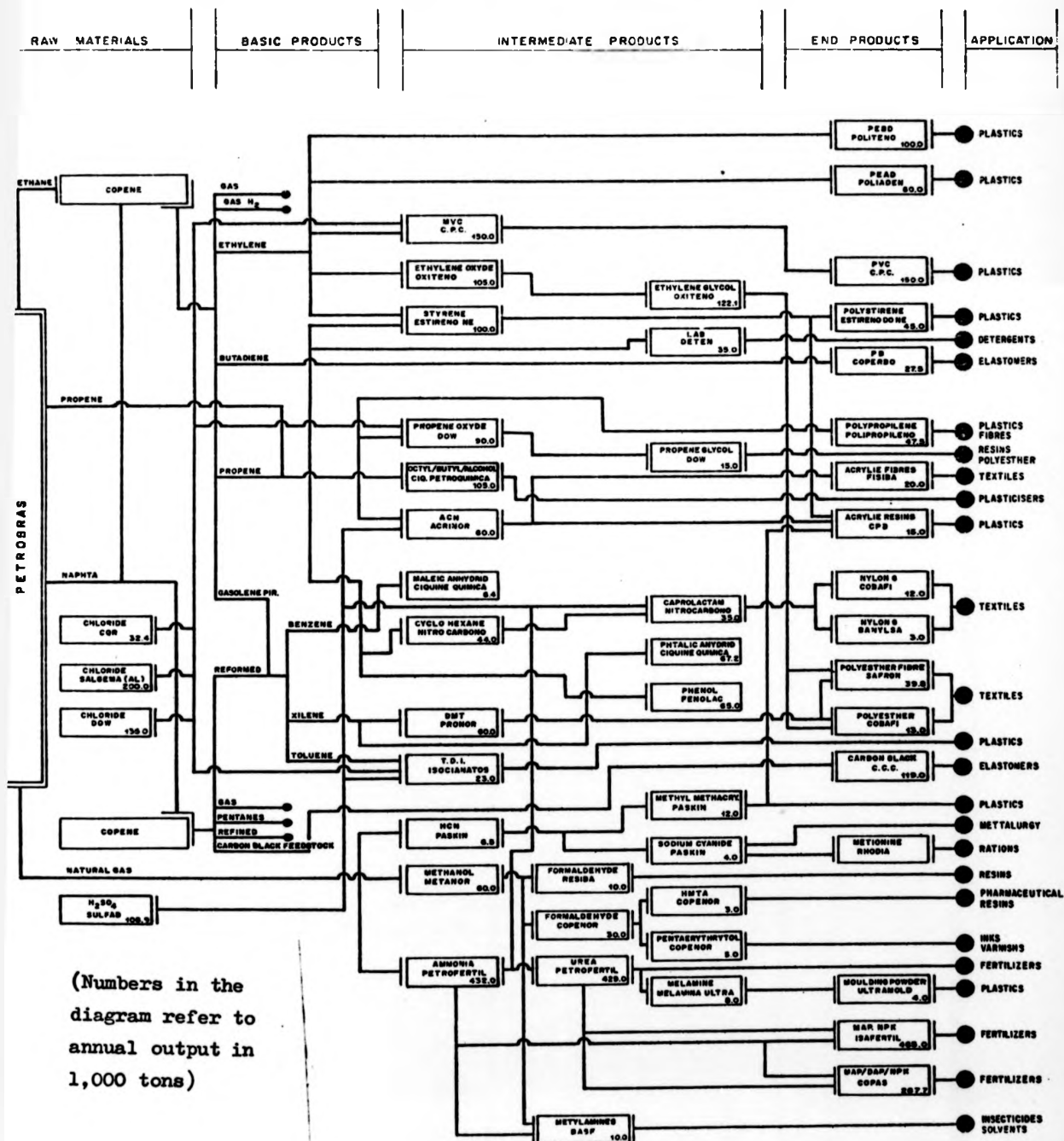
The function of a pole, however, is not only to sell its production to other companies of the same pole, but to create an environment suitable for other satellite companies to appear. Selling products is not only a proper function but vital to the survival of any industry. The concept of pole goes beyond that however. It should sell its products to companies it helps to create. The appearance of a large linkage of industries in the North East, besides being an objective of the Government plans for the region is also fitted to the requirements for a healthy functioning of a growth pole. The extent to which Camaçari will be able to do that is, then, a double government task in its role of creating more jobs in the area and also in its entrepreneurial role as a shareholder of the petrochemical pole. It is also a business job in its social objectives and in the reasoning behind the creation of the pole, and a consequence of the public incentives given to the installation of that complex.

(i) List of Companies to be considered in this work

In Appendix A, there are more details about the firms of the pole as they appeared in diagram n.2.3. They are presented according to location and in alphabetical order with additional data on the year of starting operation and jobs. It includes firms in project stage as well. There are other firms in project stage

Diagram No. 2/3 - Interconnections among the firms of the pole

## THE NORTH EAST PETROCHEMICAL POLE



(Numbers in the diagram refer to annual output in 1,000 tons)

**Source:** COPEC

outside the basic complex area, such as Salgema and Coperbo. Here, we are concerned mainly with industries located at the COPEC area or in the RMS.

Diagram n. 2/3 shows the main interconnections among those firms. It gives an idea of apparent integration of the companies with the local markets as far as supply of raw materials is concerned. If we look more carefully to the same diagram, that initial apparent integration fades away. The origin of the raw materials is the same companies which comprise the pole, with few exceptions. It looks as if the pole was only a big company which produced pure products for its own purposes and others to be sold mainly in the national markets, a small percentage locally and an even smaller proportion for exports.

Study undertaken by the SIC (Bahia) has stated that the pole acquired 85% of its raw materials locally, 8% in the rest of Brazil and 7% from international markets. The destination of the products has 32% for local markets, 67% for Brazil and 1% for exports. Again, if we consider the transactions among the pole companies the figure for the State would be much smaller.

Of course, the processing of raw materials at the region is an economic advantage but it is not sufficient for the whole integration a pole is supposed to create. A pole like that can turn to be an enclave similar to that pointed by Aydalot in his studies of the gas reserves in France (see 2.2.1).

Similar analysis made among other firms of the NPP inside the RMS (CIA) shows the same trend. Their raw materials come mainly from the local markets but their output are destined to other locations outside the region.

In the two precedent tables, local means the State of Bahia, whence some of the products sold at the North East region are included in the

national market. Anyway, the proportion of the output going to other States of the North East besides Bahia is very small and would not make much difference.

(ii) Linkages and Interconnections among the Firms in the NPP

The interconnections among the firms of the pole are shown in diagram n.2.3 which also guides us towards the definition of the main industries that will be considered in this study as being part of the pole when it satisfies the following conditions:

- (a) It is a manufacturer of petrochemical products, or end-product based on petrochemicals and
- (b) Either it sells most of its output to other firms in the pole or it purchases its inputs mainly from firms belonging to the same complex, independently of its geographical location.

So, RLAM, a Petrobras refinery is not considered as belonging to the pole, because its main production of combustible oil and gasoline goes to the consumer market and not to other firms of the petrochemical complex. But Dow Química belongs to it, notwithstanding its location being out of Camaçari.

So, the firms we are dealing with, with their main products, markets, raw materials and their origins are discriminated in the next pages.

(d) The Transformation Industries based on Petrochemical Products

Many other firms are, however, aggregated to the pole idea by a dependence they have on those petrochemical feedstocks. Many other firms that have been settled in the North East depend partially or entirely on Camaçari to get its feedstocks. They are the transformation industries of petrochemical products, proposing to make consumer-end goods for the public.

In fact, these industries are located all over the North East, not only in Bahia. A research undertaken by BNDE/SUDENE/BNBI PETROQUISA has found 82 of those industries in the field of plastics, 18 in electronics. There are some more in fertilizers, and other products (see 3.9).

In an extensive program of interviews and visits to companies already settled in the North East, they have confirmed that, even without being directly dependent on the pole, they have at least a circumstantial dependence on Camaçari. The establishments of the pole solved their acute problems of raw materials, which they have to buy in other markets, generally in the South East or abroad, where they have to face all different sorts of problems such as shortage of the product, restrictive quotas, high cost of transport and so on. The coming in sight of the pole by clearing the feedstocks problem has managed to avoid the close-down of some transformation industries in the North East. The pole has, then, the power to aggregate existing companies to its sphere of influence. We will turn to this subject when discussing a strategy for the transformation industry based on petrochemical products (see 3.9).

#### CONCLUSION

According to the theory, petrochemical industries can perform a role of growth pole in Perroux's sense. They possess all the requirements needed for an industry to become a growth pole, as can be shown by the large use of petrochemical products that are present in virtually all other kinds of industries. Their dynamism can be drawn as from their linkages with other industries, as from their growth and from the diversity of their production line.

As regarding the government action in the region, it has evolved from an initial concern over the "droughts" and 'engineering works' to prevent them to a position of development plans where other aspects of the region,



especially, industrialisation were considered. The last step in this direction was the option for large scale projects, one of which is the NPP.

As the lack of regional linkages and roots was a serious problem in previous programs of industrialisation in the North East, the advent of large and integrated industrial complexes is expected to overcome those "linkages and roots" problems. So, at least in theory, these industrial poles are an improvement in relation to the previous policies.

The impact of the pole on the North East region does not depend only on the nature of the petrochemical industries, but also on their real adaption to the local environment. The mere fact that the petrochemical industry has a broad network linkage does not mean those linkages exist in the North East. On the contrary, due to the poor structure of the regional industry, those industries need to be created almost from the scratch, whence a special attention must be paid to the creation of peripheral industries with solid roots in the region for the consolidation of the pole. If the pole is to be managed according to its capital intensive nature, on a profit conscious, well rationalised and competitive business basis, social objectives such as the provision of jobs, could be attained only by the arrival or coming-in-sight of these new peripheral units, whence the efforts to build these linkages must be even stronger.

Furthermore, as the pole is the leading industrial development project in the NE, headed by the government, it has also some solid commitments regarding its social responsibility. In the case of petrochemical companies, these social objectives are not only an obligation from the social responsibility point of view, but also a vital element in the strategy for its survival and consolidation, since they depend on the spread of their roots. As the provision of jobs is expected to come especially from the new companies to come into the area and there are no guarantees they will join the pole, the prospects of a major impact in the area are all far from bright.

CHAPTER 3: THE PETROCHEMICAL INDUSTRY

### 3.1. INTRODUCTION

This chapter deals with the nature of petrochemical industry, its trend and its characteristics in the world and in Brazil. We begin our work with a concept of the industry, its nature and the intimate relation between oil and chemical and petrochemical companies. The objective here is to establish at which stage, an oil company leaves its oil operation to go into petrochemical processing and to set the influences of this concept on the petrochemical industry in Brazil.

Then, a section on the general characteristics of these industries is introduced to verify whether they are in line with the pole objectives. Do they help the attainment of the goals set for them? Do these characteristics help the organisation of petrochemical industries in Brazil in the form of poles?

By the nature of petrochemical industry - capital - intensive - sophisticated technology etc (see 3.4) - the NPP cannot be expected to play a major role in the solution of the ailing unemployment of the region (see chapter 1). In order to achieve its objectives there was an initial assumption for fast growth of the transformation industry based on petrochemical products. The chapter considers the degree to which this has, in fact, been achieved.

The NPP comprises a concentration of industries in a given point. This fact must affect the life of the community in which it is settled. If the idea works then the area can anticipate local improvements for industry in general and for the population at large. We explore how far this expectation is fulfilled for industries and reserve for Chapter 6 the expectation of the local population.

Considering these points, we head for a general strategy to counter-

attack the present weaknesses of the pole.

### 3.2. The Chemical & Petrochemical Industry

#### 3.2.1. Chemical Industry

The chemical industry is concerned with the conversion of one molecular form to another on a commercial scale. This operation requires many technological stages from the preliminary treatment of raw materials through the changes of molecular forms up to the purification of field products. This concept, however, is too broad to be operational, since other industries also operate molecular changes without being considered essentially as a chemical industry; for instance, iron and steel, metallurgy, food industries. Furthermore, chemical industries "have moved into businesses in which the basic technology is by no means simple chemistry and chemicals" (Bradbury, 1972).

#### 3.2.2. Petrochemical Industry

Petrochemicals is a widely used term to designate the chemical products derived from petroleum and natural gas. Some authors avoid this word, because "it is etimologically undesirable, specially in latin derived languages". They prefer the expression petroleum-chemicals or even "chemicals from petroleum". As petrochemicals is a word of increasingly world-wide acceptance, this thesis will use it to designate the chemical side of the petroleum industries. The petrochemical industries represent that segment of chemical products from raw materials derived from petroleum (Shell 1966) to the diffusion of petrochemical products, many products are popularly called petrochemicals independently of their source. In fact, people who buy a single chemical product are not particularly interested in the technical specification of it but in its performance or qualities. An example is those

who buy MVC fibres are not necessarily concerned with the chemical formulae of it but in the properties of that fibre, such as its strength, its weight, etc. To make that fibre, the chemical industry has contributed not only with some chemical operations (the change of molecular form of the initial polymer) but with other physical operations for the customer to have an acceptable and handleable product.

### 3.2.3. Division of the Chemical Industry

Traditionally, chemical industries are divided into organic - products with a high proportion of carbon - and inorganic. Petroleum being basically a mixture of hydrocarbons, it follows that the chemicals made from it are generally organic. Inorganic products are also possible, such as sulphur, cyanidrid acid, ammonia, etc, which occur as impurities in the oil stock.

### 3.3. RELATIONSHIP BETWEEN PETROCHEMICAL AND OIL INDUSTRIES

As the feedstocks used by petrochemical companies are hydrocarbons, whose molecules have the properties of combining between themselves and with other elements, the number of products coming from petrochemical sources are very high going easily over a million. It is said initially all chemical organic products can be made from petrochemicals.

Petrochemicals are, then, a mixture of chemical technology on one side and petroleum (oil) industries on the other. The relationships between these two industries to produce petrochemicals are so close that their operations are inseparable in many cases. It is very difficult to say exactly when the oil industries finish their processes to yield a place to petrochemical companies. Infact, the chemical industries, besides using materials from petroleum, took advantage of the sequential and raw continuous operations the oil companies use to process their fluid materials.

the oil takes advantage of the technology developed by the chemical industries to transform different raw materials into sophisticated consumer's products. That is the reason why the oil companies are firmly engaged in the chemical business. Shell, BP, Exxon and the like are also important chemical producers, (Chemical & Engineering News, May 31st 1976).

These interrelationships explain the reason why petrochemical companies are generally found in regions where either chemical companies have achieved a high level of technology or where oil refinery and gas extraction plant are highly developed.

Summing up the relationships between petroleum and chemical industries interested in producing petrochemicals, a general rule can be formulated: "The former supply the latter with raw materials and the latter manufacture finished products (Shell, 1966)". There are many exceptions to this rule and the best way to verify them is to analyse each petrochemical complex or single company. As a result of this analysis, the following associations might be found.

#### 3.3.1 Association between Oil & Chemical Companies

- (i) Petroleum companies supplying raw materials and intermediate products to chemical firms;
- (ii) Petroleum companies extending their activities beyond the intermediate products to include end products;
- (iii) Chemical companies using different raw materials (naphtha, natural gas, liquified petroleum gas) in small proportion to manufacture petrochemical products with their own technology, i.e. ICI;
- (iv) Joint ventures between an oil and a chemical industry.

#### (a) The Previous Associations in Underdeveloped Countries

A common case in developing countries is the association of an oil and a chemical industry to buy patents and technology of another industry. The extent to which the association with more developed foreign companies can help the acquiring local companies to create their own technology is difficult to assess. First of all, the acquiring company can be buying an obsolete technology, or even, if it has acquired an up-to-date process, it can be obsolete in very few years due to the fast innovation in the technology of petrochemical industries. Secondly, the acquisition of highly sophisticated, capital-intensive technology is always a controversial question in developing countries. When they opt for advanced technology, they might want assurances that labour-intensive operations will assist in some stages where it is possible to use unskilled or semi-skilled labour. This is apparently the way chosen for the development of Brazilian petrochemical industries. Other countries, such as Mexico, have opted for the development of its own technology with good success up-to-now, in the sense that they have to go through many difficult stages to arrive at the petrochemical products they want. Independently on the question about technology, the four combinations we have seen above, are likely to appear wherever petrochemical complexes exist (UNIDO, 1966).

#### (b) The Case of Brazil

In Brazil, as we will further explain in section 5, these combinations are definitely represented. It was PETROBRAS, the state-owned oil company, which began supplying raw materials to the first chemical industries in Sao Paulo; afterwards, it began its own production of rubber in Rio de Janeiro; Rhodia also started its production of ISOPROPANOL from petrochemical feedstocks, and, finally, the majority of the present Brazilian petrochemical projects seem to be under association (iv). It is PETROBRAS, through its

subsidiary PETROQUISA which is heading further development of this business.

#### 3.4. GENERAL CHARACTERISTICS OF THE PETROCHEMICAL INDUSTRY

Petrochemical industries present very similar patterns of installations, processes and output, independently of the countries where they are located (see also 3.3). The following characteristics can be indicated.

##### 3.4.1. Product homogeneity and standardization

Petrochemical products are defined by rigorous chemical formulae and their specifications are fully prescribed by international standards. There is not much room for a company to innovate with new models, design etc. as can be done in the automobile industries, for instance. Any innovations are likely to be in the technological process or in new combinations routes to achieve a given end product (see 3.7).

##### 3.4.2. Process continuity and stability

This is derived specially from the fluid nature of raw materials for petrochemicals. As they are liquids or gases, it is obviously much better to operate them in a continuous process through pipe lines, than use other forms of transport that will require frequent process breaks and batch production.

##### 3.4.3. High Capital Intensity

The investment put into petrochemistry is very much higher than the cost of labour. Also, a petrochemical plant requires a sophisticated machinery of very good quality and material to process the raw material without being in danger of corrosion and explosion. Investment per unit of output is very high and the capital/labour ratio has been calculated to range from US\$20,000.00 to US\$100,000.00 for each new job created (Mercier, 1966). At Camaçari, this ratio is then about US\$180,000.00 for each new direct job.



The difference is partially explained by the successive increases of oil prices since 1975, which has forced the government to put much more capital in that project than it was initially planned.

To take advantage of economies of scale, petrochemical plants are increasingly being planned to produce more output. Small petrochemical units can be unprofitable or at least not have the same profitability as the large ones. The reason is that the investment in petrochemical is not directly proportional to the capacity of the plant but varies according to a power factor lying generally between 0.60 and 0.85 (UNIDO 1966). See the next table for an example.

Table n.3.1. Costs of Plans for the Production of Ammonia

Capacity	Tons/Day	
	300	400
Variable charges (not including labour in US\$ tons/day of ammonia)	9.8	9.8
Fixed charges (including labour)	44.8	40.2
Production cost	54.6	50.0

Source: Unido, (1966) Vol. I, pp 32

Another example quoted by UNIDO (1966) illustrates the proportion capital/labour in petrochemical plants for developing countries. A petrochemical complex for the production of synthetic rubber and other similar products in Argentina has an average investment per worker of about US\$100,000.00.

#### 3.4.4. High proportion of skilled labour, including technicians and scientists

The operations of complex installations require highly qualified technicians in the field of metallurgy, chemistry, mechanics, control, etc. A plant in Trinidad for the production of ammonia fertilizers employing 263 people will use only 22 labourers, but will need 145 technicians, engineers and scientists (UNIDO 1966). This subject is dealt with in chapter five, when will discuss the problems peculiar to each one of the labour categories.

#### 3.4.5. Fast Obsolescence of its processes

This is due to a continual improvement and innovation in technology or to a new route to get the same product. The chemical industry in general and more particularly the petrochemicals are among those sectors which spend very highly on research and development.

#### 3.4.6. Availability of alternative production processes and raw materials

Raw materials from petroleum have increase their share in the chemical industries in general. Researchers are continually discovering new processes to make different products from the same feedstock, or, the same product from different sources.

Besides these general characteristics, other factors are closely related to the development of petrochemical industries. They have generally organised their plants with (i) complexity of installations and (ii) backward and forward integration of all units.

#### 3.4.7. Complexity of Installation

An installation of a petrochemical plant is a truly interdisciplinary job. This requires specialised teams on design, transport, construction, mechanics, etc. As the petrochemical units are usually built near refineries to take advantage of cheap raw materials and to minimise costs of transport, a specialised team to connect the feedstocks from the refinery to the newly

built petrochemical plant is necessary. In our study, this factor will play a major role in the development of Brazilian engineering companies.

#### 3.4.8. Backward and Forward Integration

The concentration of industries in close areas is a very common fact. Very few sectors, however, offer more advantages for the industries to cluster than the petrochemical sector. Petrochemistry has a process of production, called family of products, whereby a given raw material is the point source for a wide variety of products, (see diagram 3.1). So, an integration backward and forward can be used to combine this family of products in the most economic way. The refineries would benefit from the use of many products of petrochemical units they use to mix up in their refined output. The petrochemicals companies will benefit from the utilization of some by-products of the refinery, besides their main feedstocks. This operation can be made by the use of pipeline among many petrochemical plants if they are clustering together.

Summing up, these characteristics help the organisation of petrochemical industries in forms of poles, where many industries depend on each other for their raw materials, their output and even their processes and technology. This concentration will have a straightforward influence on the local community that will be obliged to house the new employees of the pole, provide a better service structure for the inhabitants and, above all, prepare the professionals the pole needs for its construction and for its operation. Infrastructure will also require the building of new roads, railways, ports and the whole range of services necessary for the operation of an industrial complex of such a size. The bigger the pole, the larger its needs for infrastructure services. This problem is even more acute by the concentration aspects. In fact, the sequence of basic, intermediate and end products have advantages to be settled in a cluster way. Even among the specific consumer end products, some are better located near their source of raw materials. Here,

we may even include goods which can be easily transported.

### 3.5. THE EVOLUTION OF PETROCHEMICAL INDUSTRIES IN THE WORLD

#### 3.5.1. In Developed Economies

Petrochemical industries grew first in those places where the chemical industries had already been developed, where demand for organic chemical products was high and conditions to produce them had been achieved. Thus, they first appeared in the USA and had a fast development during the war period. After the war, petrochemical industries developed in Europe and Japan at a pace even faster than in the USA.

#### 3.5.2. In the Third World

There are, however, obvious advantages in having some petrochemical plants near the refineries and oilfields. An increasing demand for organic chemical products and political-economic policies related to the desire to develop industry in backward countries have determined the establishment of these industries in the Third World. This point has called the attention of the United Nations, which promoted conferences and symposiums to deal with it. For the purpose of petrochemical industries the developing countries have been classified into three distinct groups:

##### (a) Countries with large petroleum and gas reserves

The first group represents those countries with large petroleum and gas resources, limited domestic markets and a generally favourable balance of payments which enable them to invest in highly capital intensive petrochemical units. The problem for this group is to assure foreign markets to export the bulk of the petrochemical output. A good example here is Trinidad and Tobago. Other newly rich oil producing countries have also their petrochemical industries, for example, Nigeria, Iran, Saudi-Arabia, and Venezuela have ambitious plans to build new petrochemical plants.

(b) Countries with good supply of hydrocarbons and large domestic markets

The second group consists of countries with good supply of raw materials and a potentially large domestic markets. Brazil, Argentina, and Mexico, three Latin American countries lie in this group. The main task here are the choice of the right products to be made and their distribution in the local, regional or even international markets.

Statistics show that the spread of petrochemical plants from the developed to the developing countries has been concentrated in this group; which has almost 90% of the overall production of petrochemicals in the Third World. Projects for new plants and plans for further developments have also a bright horizon in those countries. Latin American is by far the leader of Third World petrochemicals producing countries, but its production and consumption are concentrated in only three countries, as shown in tables n.3.2. and 3.3.

(c) Countries lacking both raw materials and potentially  
large domestic markets

The third group represents those countries lacking petroleum resources and potential domestic markets. The majority of developing countries are in this group. and they are, inevitably, importers both of oil and oil-related products.

3.5.3. Latin America and Brazil

From the table it is clear that the leading petrochemical producing area in the Third World is Latin America and Brazil is its main producer. As far as consumption is concerned, those three countries - Brazil, Argentina and Mexico - are responsible for more than 60% of the total Latin American forecasted consumption by 1980. Brazil is responsible for 41% of Latin American consumption and 53% of South America.

Table n.3.2. Production of some petrochemicals in Mexico, Argentina and Brazil with the rest of Latin America, Africa and Asia estimated by UNIDO - 1980.

Thousand Tons /year

Area	Basic Plastics				Fibres		New Projects in 1973 US\$ mm
	Benzene	Ethylene	Polyethylene	PVC	Polystyrene	Polyester	Polyamid
Mexico	60	210	270	200	72	22	12
Argentina	133	319	140	120	60	30	24
Brazil	208	485	234	150	80	80	60
	401	1,014	644	470	212	132	96
Rest of Latin America	150	430	341	205	72	53	48
Sub-total	551	1,644	985	675	284	185	144
Latin America							
Africa	36	280	172	203	51	21	57
Asia	102	360	1,020	677	227	240	289
Total	689	2,284	2,177	1,555	278	261	346
							3,616

Source: The Petrochemical Industries - Unido, New York, 1973

Table n.3.3. Consumption of some petrochemicals by 1980 (estimated by UNIDO). Mexico, Argentina and Brazil are compared to the rest of Latin America, Africa and Asia.

	Plastic				Fibres		
	Polyethylene	PVC	Polypropylene	Polystyrene	Acrylic	Polyamid	Polyester
Mexico	250	200	50	70	8	22	20
Argentina	140	120	26	60	9	30	24
Brazil	275	240	50	80	20	80	60
	665	560	126	210	37	132	104
Rest of Latin America	339	260	46	76	18	70	70
Sub-total	1,004	820	172	286	55	202	179
Africa	200	187		55	17	36	67
Asia	774	637	151	244	76	292	253
Middle East	152	156	N/C	59	22	57	69
Total	2,130	1,800	323	644	170	597	563

Source: The Petrochemical Industries UNIDO N.V. 1973

### 3.6. EVOLUTION OF BRAZILIAN PETROCHEMICAL INDUSTRIES

The initial development of petrochemicals in Brazil was delayed for two reasons. First of all, the controversy around the existence of raw materials within the national industry. Secondly, once oil was discovered and a monopoly granted to a Federal organisation, the discussions that were undertaken to establish whether petrochemicals were included in that monopoly or not. This question was further complicated by the uncertain situation between the oil and the chemical industries 'when is oil not oil but a chemical industry?' (section 3). Those discussions were stopped by an official resolution of the 'Conselho Nacional de Petroleo - the state body responsible for Brazilian petroleum policies, which established that petrochemicals were outside the limits of the state-monopoly. From that point until now, the resolution of Brazilian petrochemical industries present three distinct periods.

#### 3.6.1. First Period (1956/1964)

Some industries were built near the Presidente Bernardes refinery, at Cubatao, Sao Paulo, to utilize its by-products as raw materials. Early in the sixties, Petrobras, Brazilian state-owned oil company - built a synthetic rubber unit near another refinery at Caxias, Rio de Janeiro. The major characteristics of this period are that the industries were settling its factories due to the availability of raw materials from the oil refineries and to the demand of petrochemicals products. All the projects of this period were timid and small and preceded by no general plans. They were a matter of opportunities derived from the availability of by-products from the refineries or even an unfulfilled demand.



### 3.6.2. Second Period (1965/1970)

This period saw the first steps towards the planning and rationalisation of the petrochemical industry. Two important facts contributed to the definition and encouragement for that industry.

#### a. GEIQUIM

First, the creation of GEIQUIM - a State body under the Ministry of Industry and Commerce - to promote, guide and integrate the national chemistry industry. This group was created in June, 1964, by Government Decree n. 53,975. In the following year, the government set up several kinds of incentives to be given to those projects which obeyed the policies of the national economic plan. Also, in 1965, the government ratified and emphasised the legal position that the petrochemical industries could be in private hands.

Geiquim approved 78 new petrochemical products and authorised many other expansion requests. Compared to the first period of 10 years, this one had a much better performance in terms of capacity of production. The first period had around 130,000 tons per year capacity all together, against 4,583,000 tons/year of the second. Part of these approved projects, however, only entered in operation during the early seventies.

#### b. PETROQUISA

The second factor is the creation of PETROQUISA - a subsidiary of the state owned Brazilian oil company making possible its association with other private or state companies to boost the petrochemical sector. Petroquisa immediately set up in association with companies already operating in the field to build large industrial complexes around with the whole range of petrochemical industries could be clustered.

### 3.6.3. Third period or period of the petrochemical Poles

(1970 until today)

#### (a) Petroquímica Uniao (PUSA) and the first petrochemical pole

By the end of the sixties, Sao Paulo had achieved scattered petrochemical companies needing some coordination of efforts to work smoothly as one big company. At that time, the plants of the earlier periods began to expand and new ones were installed. It was thought that the construction of large complexes for basic petrochemical feedstocks was a necessary condition for the stability and prosperity of the petrochemical industry. In June, 1972, the creation of Petroquímica Uniao was the signal for the first petrochemical complex. Together with other petrochemical plants settled in the region, that complex achieved a great importance, becoming thus the first petrochemical pole integrated with many units where Petroquímica Uniao (PUSA) played the major and dominant role.

#### (b) COPENE and the 2nd Petrochemical Pole

In July, 1970, the main points for the installation of a 2nd petrochemical pole in Bahia were settled. The big difference between this pole and the first one was its planning from the beginning and the intention that the two poles should be integrated and interconnected with each other. The whole project was made to integrate a few industries, already, operating in the administrative area, plus the implementation and centralisation of the majority of new units into a single place, whereas in Sao Paulo, industries were established in a variety of municipalities, Cubatao and Capuava being the most important ones. The North East Petrochemical Pole has only a couple of units outside the municipality of Camaçari and Dias D'Avila, that is the reason why it is very often called Camaçari Petrochemical Pole. To carry out the planning and supervision of the works of the pole, Petroquímica, then, created its

own subsidiary - COPENE - Companhia Petroquímica do Nordeste.

The pole was due to be built in two stages. First, the installations of units based on aromatics (benzene, toluene and xylenes) second, the construction of a central unit for raw materials and other units based on olefins (ethylene, propylene, etc).

#### (c) COPESUL - The Third Petrochemical Pole

By the end of 1973, three companies were already operating in the pole with many other approved projects. By 1978, the companies in operation and under construction plus the approved projects totalled more than forty. By 1975, the government had decided to create a third planned pole, using the experience of Camaçari. COPESUL is the new Petroquisa's subsidiary to carry out the planning of this new pole, located in the extreme South of Brazil, near the Uruguayan and Argentinian borders. The installation of a fourth and fifth pole are already in the government plans.

#### 3.6.4. Planning the Expansion of the Poles

Due to a general euphoria derived from the high rates of development experienced by the Brazilian economy in the beginning of the seventies, there were plans to invest several billions of dollars in those first three poles to put Brazil as a big world petrochemical producing country during the 80's. For a quick analysis, the next tables bring the relation between the production capacity of the petrochemical poles of Sao Paulo and of the North East and the forecasted consumption of some petrochemical products.

The data of the tables n.3.4 and n.3.5 give also a comprehensive idea of the relative importance of the North East and Sao Paulo pole in the Brazilian petrochemical industry.

Table n.3.4. Production capacity of the North East Petrochemical Pole  
compared to Sao Paulo. (000 tons)

Product	Sao Paulo	North East
Plastics		
Polyethylene LD	110	100
Polyethylene HD	30	60
PVC	127	100
Polystyrene	85	63
Polypropilene	50	50
Synthetic Fibres		
Nylon & Nylon	60	100
Polyester	66	132
Acrylic	12	11
Synthetic Rubber	110	73

Source: Petroquisa

(a) Planning the development of the NPP

By the time of the establishment of the first petrochemical pole, Sao Paulo had already a well diversified industrial park and also a reservoir of labour already trained for industrial work. Sao Paulo was responsible for 80% of the transformation industry in Brazil, while in the NE, there was no -such developed industrial structure to match. Clearly planners and policy makers have an additional task to attract industries and also to train the refined labour force.

Table n.3.5. Forecasted consumption of some petrochemical products in 1974, 1980 and 1985, according to the zone under the influence of each of Brazilian Petrochemical poles.  
(1000 tons)

Regions		1974	1980	1985
Zone under the influence of the North East Petrochemical Pole				
Plastics	100.0	315.0	700.0	
Synthetic rubber	24.5	55.0	105.0	
Elastomers	29.0	53.0	90.0	
Zone under the influence of Sao Paulo Pole				
Plastics	390.0	1,150.0	2,380.0	
Synthetic rubber	97.0	205.0	360.0	
Elastomers	132.0	220.0	350.0	
Zone under the influence of the petrochemical poles of Rio Grande do Sul				
Plastics	110.0	335.0	720.0	
Synthetic rubber	26.5	60.0	110.0	
Elastomers	39.0	67.0	110.0	
TOTAL	Plastics	600.0	1,800.0	3,800.0
	Synthetic Rubber	148.0	320.0	575.0
	Elastomers	200.0	340.0	550.0

Source: Associacao Commercial do Rio Grande do Sul

Being the second pole to be built the NPP has an hypothetical advantage over Sao Paulo regarding the possible transfer of technology and know-how after which the pole would be able to carry out the task of developing its own technology. The whole thing, however, will be feasible only if the pole pursues the right policies to acquire that technology and to have its human resources highly trained to undertake that task.

The way the pole has been built, however does not seem to have made use of that advantage (see 4.2). The use of foreign engineering firms and processes, outside technology and patents without a national strategy for the development of a national technology or, at least, a body of skills and experience to operate, and ultimately develop along its own lines, the technologies which have been acquired, would certainly delay the creation of an independent know-how. It is the transfer of technological knowledge so that the operators and technicians do not need constantly to refer back to source but are themselves competent in an independent way. Furthermore, the time lag between the building-up of the poles are too close to allow a wide exchange of experience and know-how.

#### 3.6.5. The Choice of Products and Regional Development

A fundamental point to set up industrial plants is the decision on what kind of products are going to be produced. When such plants have the regional development as one of their objectives further points to find out the relevance of those products for the region must be raised.

The answer to these points gives beforehand an indication of the importance the regional development has for the policy makers in the pole. It would be ideal to develop a list of products that could be complementary to the regional industry or that could be established in the area with evident advantages in terms of location. Another option is open for those products that could start the installation of new industries with strong multiplying effects of employment and income.

The problem is that the main products of the pole do not marry to the traditional industries of Bahia and of the North East. Even the textile industry is based on natural rather than synthetic fibres. The only exception to this problem is the incipient chemical industry - especially the transformation industry based on polyethylene and PVC - that has received a little boost with the implementation of the pole. There has been a small growth of the transformation industry that, even falling far short of the forecasted growth, indicates that their development is feasible in the North East. Only in the state of Bahia in 1978, there were 40 industries in the field of plastics. Even so, the stated aim of utilising around 30% of the pole output in the region is far from being accomplished. The pole, nowadays is exporting more than 90% of its output, which means there is an enclave at the region that is similar to a plant that is taking nourishment from the soil but giving nothing back.

There are some products such as LD-Polyethylene, whose consumption in the region is increasing. In 1978, around 10 thousand tons were transformed in the North East, but there is firm ground through the presence of new industries to believe that there will be an increase of 100% in that usage. The growth in consumption of a few products does not affect significantly the position of the pole as an exporter of raw materials rather than a catalyst industry in the area. That indicates again the nature of the pole as a national rather than a regional priority in the sense that the multiplying effects would be higher in other parts of Brazil than in the North East.

A serious excuse that can explain partially the manufacturing of products that are processed locally is the concept of family of petrochemical products, that is described in the next heading. After the cracking of oil gas or naphta, a very wide series of semi-manufactured products appear which go towards the making of a multiplicity of further intermediate and end products. The specialisation of a pole on only one product is then not

economic and odd in managerial terms. The harmonious development of a whole family of products with a single basic petrochemical technology requires strategic thinking of a complex nature. Following on the basic strategy the development plan demands a whole series of sub-plans for intermediate and end products right up to consumer-level.

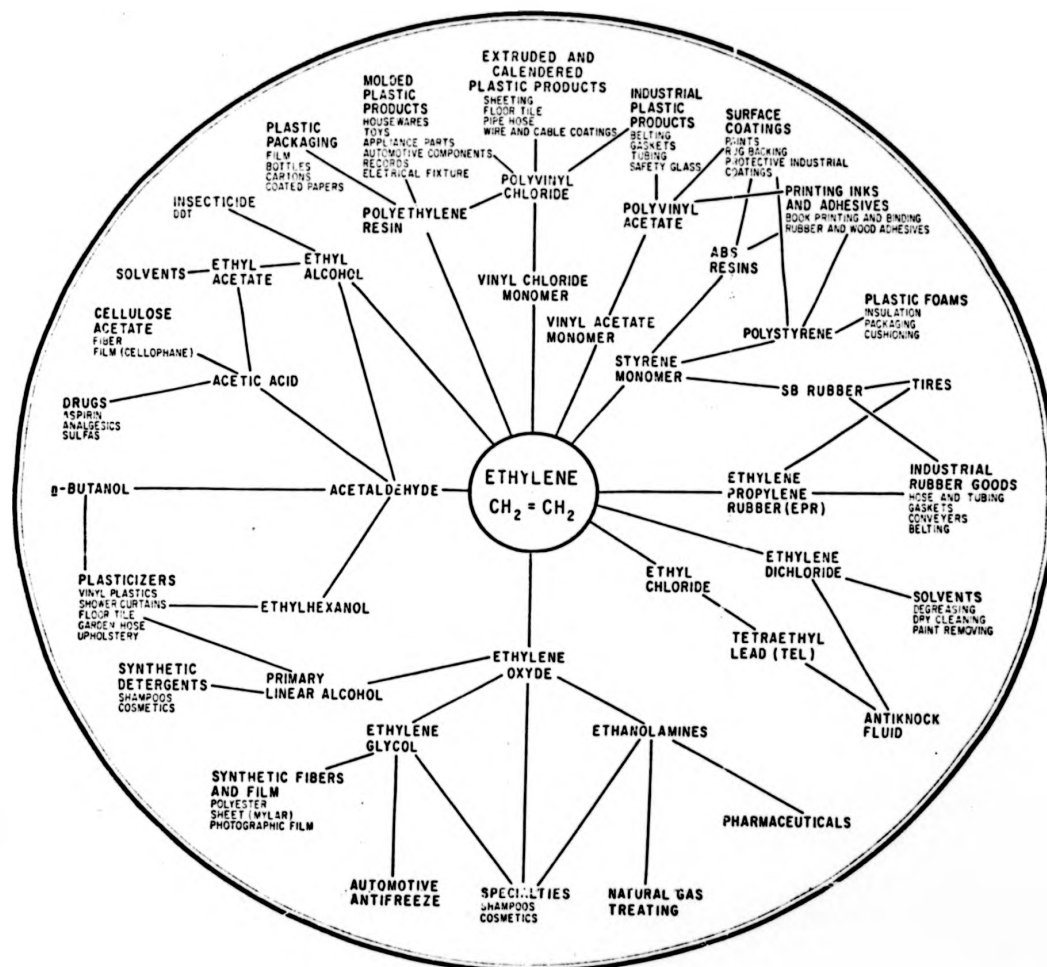
On the other hand, the development of all the petrochemical segments at the same time is certainly a bit unreal, when there is a lack of resources to build even a few transformation industries. The solution is, then, to concentrate efforts in some fields where the region can show itself a strong competitor. The strategy should be selective and regionally based. It is important to realize that a sector such as fibres, fertilizers and elastomers can bear a vast range of industries. The planning efforts, however, appear to have stopped at the point where the petrochemical complex was agreed on and before any consideration had been given to the transformation industries, notwithstanding some delayed efforts undertaken by the state Governments. We cannot see any serious disadvantages for the development of any particular industry using petrochemical feedstocks as far as it wants to join the pole. The wrong point, however, is the absence of a positive strategy to create special incentives for down-stream industries that could fall in line with the regional development needs, industries with strong regional linkages, labour-intensive or other characteristics capable of counter-attaching the weaknesses of the basic complex.

There are many fields of those down-stream industries, which can be fitted into the regional needs. Fibres, if there is a program to marry the interests of the traditional textile industries with the new ones, are a good example. Further opportunities can be seen for fertilisers, plastics and elastomers. The fact, however, is the absence of any serious attempt and strategy to make the pole a leading industry to attract any defined sector of the transformation industry. Fortunately, this mistake seems not to be repeated in the Third Pole (Rio Grande de Sul), where class associations of different segments of industries are discussing ways of



Diagram No. 3/1

## ETHYLENE PRODUCTS 'TREE'



(Based on a leaflet by Alberta Ind. &amp; Commerce)

making their views heard at the whole planning of the pole.

### 3.7. FAMILIES OF PETROCHEMICAL PRODUCTS

Petrochemical products are usually distributed as inputs to a variety of other industrial sectors. Broadly speaking, it is hard to find out an industry which does not use some sort of petrochemical input. There are some doubts about the exact point where the oil industry finishes to yield place to the petrochemical ones. Technicians, engineers and economists are not unanimous on this field, due to the intrinsic and interdependent relationship between both industries. This interrelationship tends to be greater in the light of the increasing chemical operations made inside the oil refineries.

#### 3.7.1. Concept of Petrochemical Family

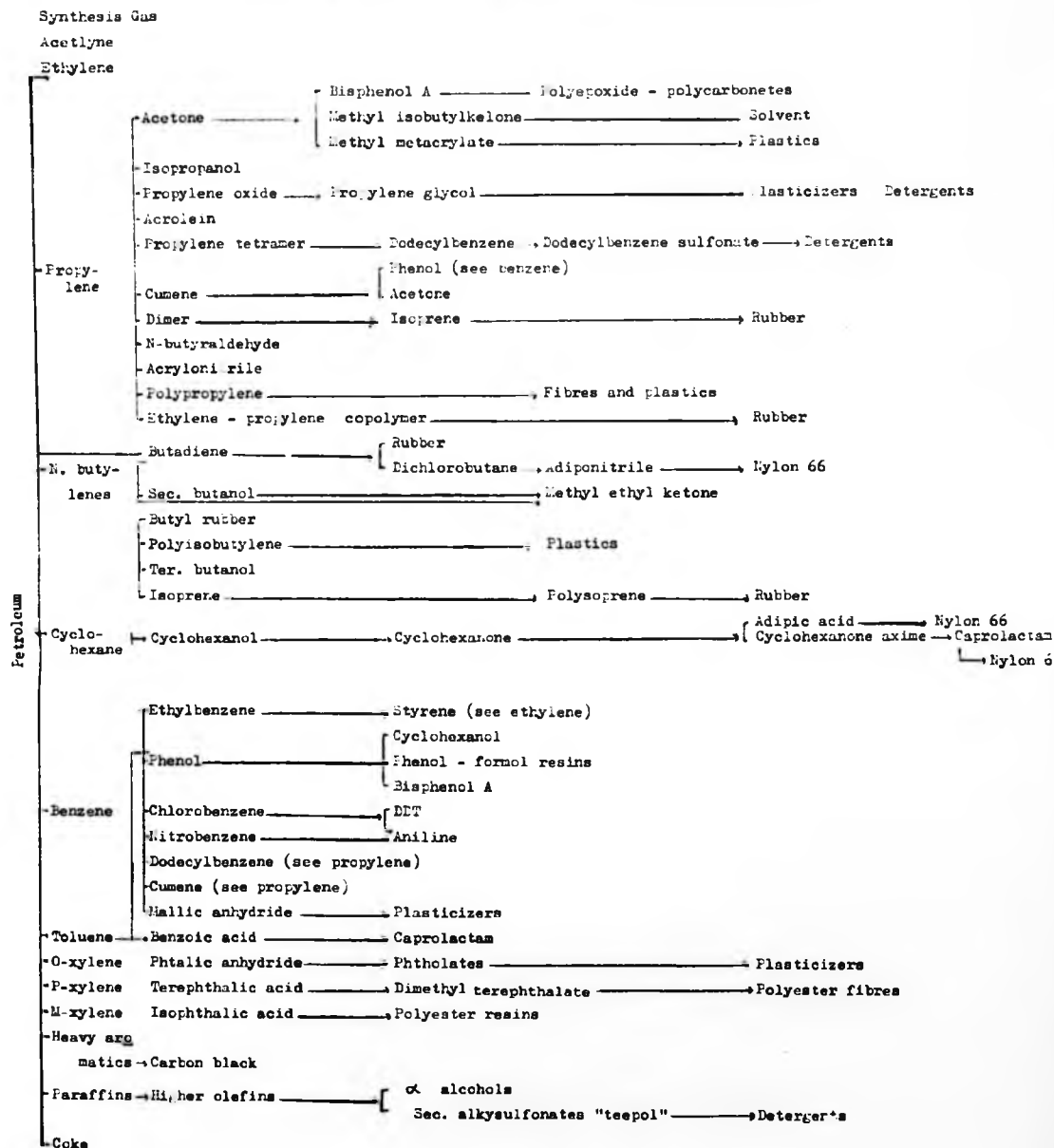
For this work a whole description of all the petrochemical products is not necessary. What is important is to understand the concept of families of petrochemical products and to know the main routes of a product in each family. A Petrochemical family is a chain of products which starts from the petrochemical raw materials and finishes in the end products for the consumer industries. This tendency for the petrochemicals to be grouped in family of products helps the trend for this industry to be vertically integrated. Other factors are many products can be derived from two or more basic petrochemicals, which results in the interrelation of different families. A good example is acrylonitrile that can be produced from propylene, acetylene or ethylene. As an illustration the following tables and diagrams give examples of petrochemical families within the main products with which this research is concerned, all based on very important intermediate materials from any petrochemical complex.

### 3.7.2. Classification of Petrochemical Products

The classification in basic, intermediate and end-use product does not mean that only the last group is ready for the market. That is not a marketing classification, but a technological one. Some basic or intermediate products can be sold as commercial products for consumption as it is the case for ammonia and alcohols. The end use product is said to be the product of  $n^{\text{th}}$  generation of petrochemical processes. There are thousands of those products but they are grouped in main categories depending on their applications. These include plastics, synthetic fibres, detergents, fertilisers, synthetic rubbers, resins, solvents etc. The first question, then, for a country wanting to begin its petrochemical industry is the choice of the products to be made.

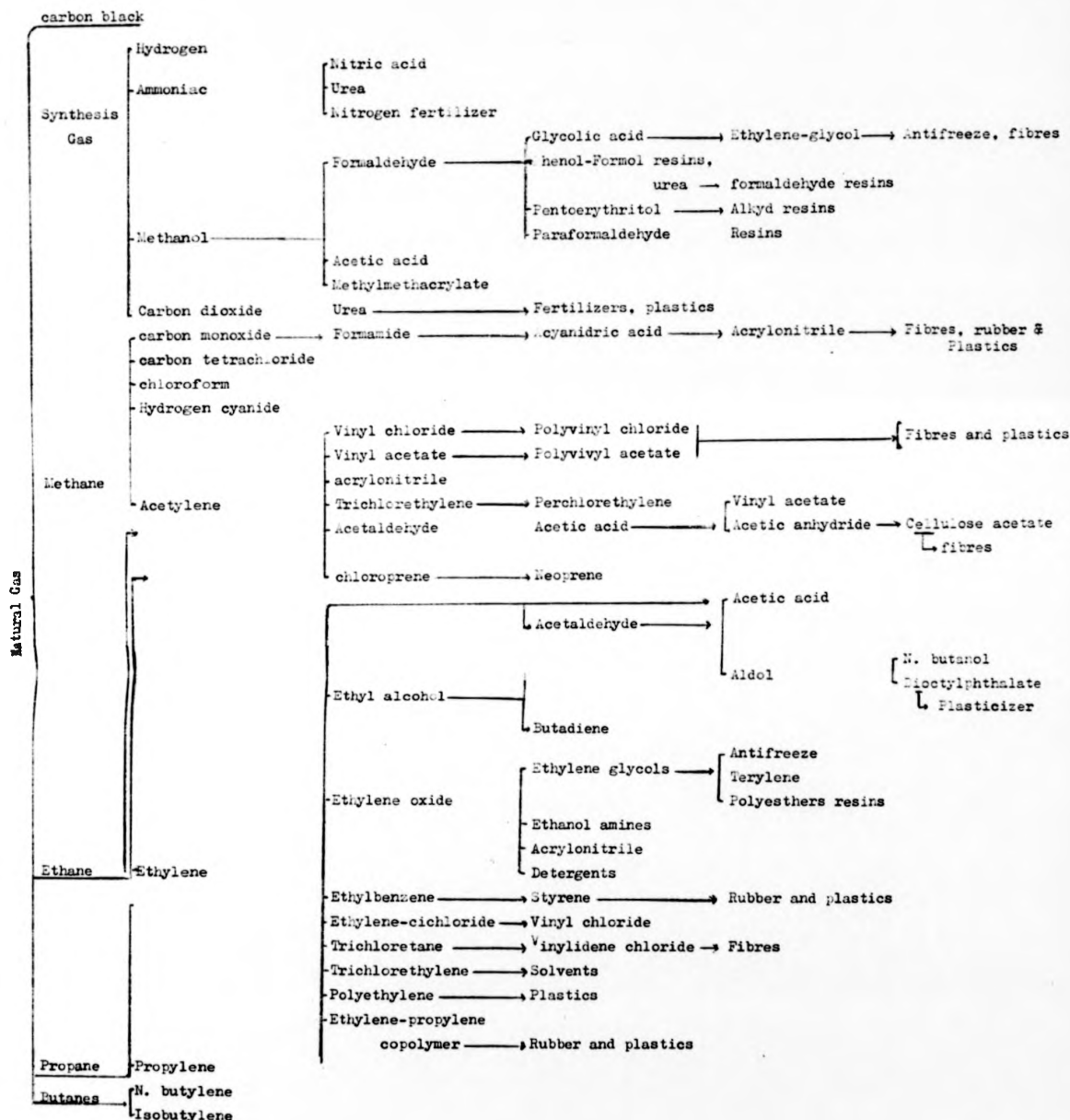
The choice will obviously result upon a product of the first generation (a basic product) if the country wants to develop its petrochemical industry. A careful research into the market demands and the availability of supply of raw materials are also an important initial steps. Suppose that the product chosen to be industrialised is ammonia. Who is going to buy it? What for? Will it be cheaper to produce it here rather than importing it? What is the influence on the regional and national economy? If the choice is a basic product such as ethylene, however, mainly used as feedstocks for other industries, the questions to be asked acquire a new dimension, going beyond the simple field of marketing management techniques. It involves the whole question of industrialisation of the country, the availability of other chemical industries to buy the ethylene's unit outputs, the development of the local human resources to carry out an extensive program of industrialisation and the previous assurance of outside markets to absorb some of the by-products to be made. It is very difficult for a developing country to absorb all the products coming from a petrochemical complex. Qatar is a very good example of a country involved in building a large petrochemical complex based on ethylene for exports. Qatar's regional market will not be sufficient to

Diagram No. 3/2 - Petrochemicals Manufactured from Petroleum: Main petrochemical routes.



Source: UNIDO (1966) The Petrochemical Industry.

Diagram N. 3/3 - Petrochemicals manufactured from Natural Gas: main petrochemical routes.



Source: UNIDO (1966) The Petrochemical Industry.

absorb a significant part of the growing industrial complex at Umm Said (F.T. Feb. 22, 1978, 27). Other oil producing countries have recently adopted similar policies.

It is evident that the choice will depend on the economic policies of that country. An ethylene plant provides a broad range of specialised intermediate products to be used by several other industries. Countries wanting to develop their agriculture may opt for those products ending in fertilisers or similar additives for agriculture.

### 3.7.3. Cooperation among Developing Countries

As most developing countries have only small markets, integration between countries and regions comprising more than one country are an essential step. In this way, countries could benefit from the advantages of having greater units (plants) for larger markets. A compromise has to be reached whereby some countries will not build plants already developed in any other neighbour, or whose construction will be more advantageous there due to the existence of other units processing its feedstocks or similar reason. Cooperation between neighbouring countries can take advantage of the natural concentration of petrochemical industry by a decentralisation of some of its units.

#### (a) Brazil and South America

This problem is also very important in Brazil independently of its potentially large markets and weak relations with its neighbours. Notwithstanding a cooperation with countries such as Argentina, Uruguay, Bolivia, Paraguay and Venezuela would be advantageous. The first has a growing chemical and oil industry well established. The latter has large resources of hydrocarbons. The others are trying to develop their own industry. In this way, the location of the third pole in Rio Grande do Sul, near the River Plate's countries can contribute to closer cooperation of the Latin American petrochemical industry.

Diagram No. 3/4 - Simplification of some important petrochemical routes.

Primary Products	Intermediate Products	End Products	
Ethylene →	→		
Ethylene + chlorine →	Vinyl chloride →	Polyethylene	Plastics
+ acetic acid →	Vinyl acetate →	Polyvinyl chloride	
+ oxygen →	Ethylene oxide → ethylene glycol		
+ oxygen →	Acetaldehyde → acetic acid	Polyvinyl acetate	
+ benzene →	Styrene	Polystyrene	
Propylene →	→	Polypropylene	
+ benzene →	Cumene → phenol/acetone		
+ ammonia →	Acrylonitrile →	Acrylic	
Benzene + hydrogen →	cyclohexane →		
	Caprolactam		Fibres
	Adipic acid →	Polyamide	
p-Xylene + methanol →	DMT (+ ethylene glycol) →	Polyester	
Butadiene →	→	Polybutadiene (BR)	Elastomers
+ styrene →	→	Styrene-butadiene rubber (SBR)	
o-Xylene + propylene →	Phthalic anhydride → (+ alcohols)		
	phthalate plasticizers		
Sulphur →	Sulphuric acid		
Methanol			
Ammonia			

Source: UNIDO (1973) The Chemical Industry.

Agreements with those countries can increase the trade of chemical products that are not processed at home. By geographical position, the third pole will have some advantages in this trade. The North East, on the other hand, is nearer to European and African markets where it could try to export one or another product.

### 3.8. LIST OF PRODUCTS OF THE NORTH EAST PETROCHEMICAL POLE

A list on the next page gives a sample of the main products being industrialised in Camaçari. Other products and by-products may be added to that list. It is not necessary, however, to include all of them, since our main purpose is to show the variety of industries those chemical products are destined for. This gives further room for the hypothesis that the petrochemical complex will give rise to a variety of complementary industries and to some specialised services industries. On the other hand, world wide experience has shown that an industrial pole is not sufficient by itself to generate economies of scale in the place where it is located (Coraggio 1973). It is also not sufficient to hope that new industries will move into the area. The prospects for them to thrive are not bright. In other words, as they will not just come, they must be encouraged in some way.

More serious yet is the incapacity of those highly capital intensive industries actually established to create a substantial number of new jobs. The approx. 14,00 created so far in the pole itself is a ludicrous figure compared to economically active population of the RMS, or even to US\$3,5 billion investment made. Additional efforts must be made to encourage the coming of new industries to transform those petrochemical outputs into new products, or else they will be exported to other parts of the country, increasing the economic dependence of the North East.

The policy for new industries presents many difficulties such as (i) what industries should be encouraged to come into the area? (ii) what kind of incentives should be applied? (iii) what products or group of products



should be made there?

### 3.8.1. What Kind of Industries?

It seems the most viable solution to bring labour-intensive industries at that stage. The main points that stress the advantages of having capital intensive companies have disappeared, when products become economic and real. As one of the objectives of the pole is the creation of new jobs it would be wrong to accept new industries that do not contribute significantly to reduce an unemployment plus underemployment rate above 25%. And much worse is to continue this policy without a clear definition of how the unemployment problem could be tackled in the near future.

Table n.3.6. Main Products of the NPP

PRODUCTS			APPLICATIONS
BASIC	INTERMEDIATE	END	
Aromatics Residues	Phenol	HD-PE	Pharmaceuticals
Benzene	Formaldehyde	LD-PE	Food Industry
Butadiene	Ammonia Sulphate	PVC	Plastics
Ethylene	Sodium Cyanide	Polystyrene	Detergents
Natural Gas (H <sub>2</sub> )	Propylene Glycol	Polypropylene	Textiles
Propylene	Propylene Oxide		Elastomers
Toluene	Urea	Acrylic Fibres	Solvents
O - Xylene	Butyl Alcohol	Acrylic Resins	Metallurgy
P - Xylene	Caprolactam	Nylon	Fertilizers
	Propylene Oxide	Polyester	Paint
	Maleic Anhydrid		Varnishes
	Phthalic Anhydrid	Methionine	
	Melamines	NPK	Insecticides
Sulphuric Acid *	DMT	LAB	Explosives
Caustic Soda *	TDI	Polyester Fibre	
Chlorine *	Ethylene Glycol	Carbon Black	Furniture
	LAB		
	HMTA		

\* Organic Products.

### 3.8.2. What Incentives?

Many sorts of incentives have been given to firms willing to move to less developed regions in order to narrow the gap between those areas and the more developed ones. Taking into consideration the characteristics of petrochemical industries, the incentives to be offered to the satellites industries must be such that they could favour the installation of industries with more linkages with the region in terms of production, consumption and labour. The most common incentives are tax reductions, long-term loans, wage subsidies and subventions for construction and infrastructure costs. As the main problem here seems to be the high level of unemployment, incentives should be given to encourage firms to employ more labour instead of adopting sophisticated mechanisation and machinery. This can be made by wage subsidies, tax reductions proportional to the relation labour/investment.

### 3.8.3. What Products?

The firms could be divided into groups according to the supply of the petrochemical output. The supply of polyethylene, PVC, polypropylene, acrylic fibre, polyesters, nylons, etc, makes industries such as textiles, packaging, plasticisers (upholstery, shower curtains, vinyl plastics) particularly attractive as far as supply of feedstocks are concerned. Fertilisers have an important role to play in a predominantly agricultural region. Other important groups are pharmaceuticals, solvents, insecticides, moulded plastic products, surface coating, printing inks and adhesives, synthetic detergents. These are industries where labour intensive techniques are possible. All these industries put together could be able to create more jobs than the basic complex. Without them, the petrochemical pole would make only a weak impact on the local employment structure this decade, but time could reduce that impact even further since the trend in petrochemical industries is for an increasing mechanisation and thus lower labour intensity.

### 3.9. LEADING SEGMENTS OF THE CONSUMER-END INDUSTRY BASED ON PETROCHEMICALS

A research by the group for the development of the transformation industry (SUDENE, w.d), based on petrochemicals registered the existence of industries in the North East, spread through out the nine States, which used petrochemical feedstocks in the segment of plastics; around 18 in the elastomers. There were other industries in the field of fertilisers, inks, varnishes which could increase that figure.

Not all of them, especially those which use other than petrochemical feedstocks as their main raw materials can be classified as a consumer end industry based on petrochemicals (see 3.6.5.).

#### 3.9.1. Characteristics of the Transformation Industries

The transformation industries, compared to the petrochemical presents some advantages in terms of the several objectives of the pole. Contrary to the petrochemical industry, the transformation industries are not capital-intensive, do not require concentration of investment, can be market rather than product-oriented, uses a fairly simply technology and have a broad range of products. These characteristics are better fitted with the requirements of employment. On the other hand, the huge area of the North East will probably dilute the effects of any transformation industry, since it tends to put scattered plants throughout the nine States of the region.

Even so, if the effects cannot be as evident and measurable as those of the basic complex at Camaçari, this does not mean that in regional terms the growth of Camaçari proves that industrial concentration is better. In fact, data about the revenues of the local government have shown a substantial growth (dia. n.6.5). Camaçari, however, is only a miniscule part of the NE. A situation

of no growth at Camaçari would be a gross failure, equivalent to have an investment of 3.5 billion dollars with no return at all.

### 3.9.2. Planning for the Transformation Industry

The transformation industry is very often considered as too fragmented to be subject to more effective control by the government, to the point that some high ranked officials suggest it is impossible to exert control. The difficulties are also derived from the enormous number of uses for petrochemical products. We do not agree that close control on the activities of those industries is impossible, since the suppliers of the feedstocks are very few and can have a systematic knowledge of their customers and what they are manufacturing. Control is important to avoid the growth of the black market for certain petrochemical raw materials, especially those segments of relative shortage of the products. An illustrative example is the case of polyethylene (low density) of which there is a shortage in Brazil. Some companies receive the product and sell it immediately without processing to other companies in the black market. This is possible due to lack of control exercised by the three producers - Politenó, Poliolefinas and Union Carbide.

### 3.9.3. Present Problems of the Transformation Industries

#### in the North East

#### (a) Unbalanced Planning

The first and one of the major problems in the planning of the NPP lies in the fact that planning for the transformation industries were made after the planning of the basic complex and apart from it. It started too late. In this sense, the NPP, as it has been conceived, is at most a plan for a big industrial project rather than for a pole (see 2.2 and 2.4.5d).

In fact, fundamental questions lie at the root of the whole project, what needs the pole and its transformation industries are trying to attend, what benefits they are bringing to the community must always be considered in the development of the whole NPP in its several stages. Seeing that the enterprises come to offer goods and services for the community, these aspects should be thoroughly discussed. For a poor population such as the North East only a few of the products based on petrochemicals feedstocks could be considered essential in terms of his basic needs of health, nutrition, housing, hygiene, education etc. Those industries provide a good service, however, in terms of jobs, in spite of the small number created directly. The ideal would be a marriage of both - essential goods and services. As far as the consumer end industry is concerned, the external objective of its production is not prejudicial, what can be harmful is the aspect of the products coming from the basic complex without further processing. The reason is that the former are important to build the industrial web of new plants as included in the notion of growth poles.

#### (b) Underutilised Capacity

This problem is more acute in Sao Paulo where the transformation industries are already well established, but there is a shortage of some petrochemical feedstocks such as LD-Polyethylene. But even in the North East whose regional industries absorb only around 10% of the pole output, many companies have had to reconcile themselves to run well below capacity due to shortage of feedstocks. It is an apparent contradiction that the government intends to back the development of this industry in the North East and at the same time causes many problems for its growth. The first problem is to leave it with unutilised capacity by an insufficient quota of raw materials, since the policy of the pole is to provide feedstocks for enterprises all over Brazil not only in the NE, making the present national production fall short of the national installed capacity of the transformation industry. According to field research the

majority of the plastic industries in the North East can increase output if a higher quota of feedstocks is delivered. In this group, we can put especially those companies processing polyethylene for domestic appliances, plastic bags, toys, slippers and sandals, for which there is an open market in the region.

#### (c) Payment Policy

Much more than the unutilised capacity for the transformation industries is the payment policy of the pole. Those small enterprises scattered through the different states have to pay for their raw materials in 30 to 45 days. If we discount a week for transport, it leaves only 21 to 36 days for payment, when they have to sell their consumer goods with credit of 90 to 120 days at the market. It is easy to see a continuous process of fast decapitalisation. After a few months, they lack working capital to operate their own businesses. That is one of the most serious discouragement of the transformation industries in the North East.

#### (d) Prices of Feedstocks

At the beginning of the last pole some products were much more expensive in Brazil than in the World market, which made domestic prices much higher than imports. Brazilian policies, however, do not allow imports when there are available products or their similar in the home markets. That is a fair measure to protect the domestic industry but it produces additional problems to the consumers. Some companies have the price of their raw material increased in a disorderly fashion after the implementation of the pole. Fortunately, this is a temporary problem, because the instability of the world prices for oil have increased dramatically the prices of petrochemicals to the point that Brazilian prices are nowadays better than in the international market.

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(e) Poor Market

The size of the North East market is undoubtedly a restriction on the development of the transformation industries in the region.

A manager of a 600 ton plant has synthesised the problem in a simple sentence. What is the purpose of creating more industries in the North East in our business - sleeping blankets - if we can deal with the whole regional demand with our installed capacity? As many petrochemical products are typical of middle class, the only alternative is the external or international market. Lack of jobs, low wages, poor communications (roads) made petrochemical products a luxury inaccessible for a miserable population. In fact, many industries throughout the North East have tried to penetrate the South East markets with good results up to now. The majority of the middle and large companies of this sector in North East have managed to put part of their output in the South East and also South markets, what must be seen not only as a commercial policy, but survival strategies. Of course, this aggression of the North East is commercially healthy, but the problem behind it is the extreme poverty of the region in general. As these industries are supposed to have a social impact in terms of jobs and industrial deconcentration, there is no point in stopping their growth, even, if their production is entirely for the external markets. The return would be gained in terms of income and wages. The problem in this strategy is that the South East industries are also running far below capacity due to the recession in the Brazilian economy, receiving also insufficient quotas, while the North East industries have received tax incentives to grow. The result, of course, is the export of unemployment from the NE to the SE.

(f) Lack of Experience

A lack of experience of the local enterprises on those segments of industries based on petrochemical feedstocks leads to a shortage of a clear understanding of all the possibilities of some products, such as



polyethylene for instance, the exact dimension of the industry, the profitability of its derived products. There is also a shortage of managerial know-how of the sector. Managers do not feel at home to develop these products, despite the good will and zest with which some enterprises come into the sector. The development of new products in petrochemistry needs a good know-how and infrastructure. Some firms do not manage to develop new domestic appliances, for instance, because they do not have a good supply of tools or operators to produce some mechanical devices to give the petrochemical raw material the shape they desire. The knowledge to make some plastic cables and a plastic shoe is similar but it needs a good mechanic instrumentist to shape the metal plates and sheets to transform PVC and LDPE in those objects. A lack of skilled labour in the North East makes this problem even worse. I have found these mechanics working on a part-time basis for several different firms because there are so few of them in the market. The size of the North East market will not allow the processing of more than a small percentage of the NPP output. Under these circumstances, one has to think in terms of national or even international markets. There is an incongruence where the central units is planned in a national strategy and the transformation industries have to be restricted to local boundaries.

#### 3.9.4. A Strategy for the Transformation Industry

The previously mentioned characteristics (3.9.1) and difficulties (3.9.3) of the petrochemical industry in the North East set up the pattern for the definition of a good strategy for the development of the pole. Important premises here are that the pole needs the development of the transformation industries for its consolidation as a catalyst activity in the area. There is no pole without the transformation industry (see 2.2).

As the majority of the industrial units of the pole have already been operating, the main key strategies lie in the efforts to build its network linkages throughout the North East. There is a need of a more effective government action, similar to that used for the implementation of the basic

complex at Camaçari, to develop the consumer-end industries. As those industries are scattered throughout different States in the North East, an inter state agency is better placed for the coordination of those efforts.

The strategy to be followed should contain measures to define some sectoral priorities and to counteract the effects of the major problems faced by those industries, that is, the lack of credit, insufficient quotas of raw material for the regional industry, lack of working capital, the expansion of the market for new commodities, and, a better guidance for managers and entrepreneurs of the North East (see chapter five).

A long term strategy needs a definition on priority segments of the petrochemical industries on which investments and efforts should be concentrated. Taking the main sectors of the petrochemical industries - plastics, fibres, fertilisers and elastomers - which of them offers more advantages for a regional development? The researches made by the group for the development of the transformation industry in the North East were based on the regional market that is small and poor. The development of this industry requires, however, the national market rather than to be limited by regional boundaries. The scale of the pole was not designed by the size of the North East market and so the transformation industry has to surpass these frontiers. The problem is very simple. The North East has not the capacity to absorb the output of the pole, but must process those products for its economic growth as has been constantly stressed. The only possible strategies are either a quick growth of the internal income per capital of the region - which takes time - or to break into external markets, and that seems to be the only valid strategy in the middle run.

### CONCLUSION

The rise of petrochemical industries in Brazil followed the general pattern observed everywhere. They tend to appear in the most developed areas, where a know-how to process petrochemical feedstocks is already developed. There is the trend for petrochemical industries to cluster around petroleum refineries; in Brazil, they began in the industrial state of Sao Paulo around the 'Presidente Bernardes' oil refinery and afterwards spread to other points of the national territory where Petrobras - the State-owned oil company - had other refineries.

Notwithstanding, the development of Brazilian petrochemical industries was delayed by internal controversy over the availability of raw materials within the national territory and by the debate about whose are the responsibility for the development of those industries, whether they should be developed by the State or by the Private Sector or perhaps some combination of the two. That delay produced a great deficit in the national petrochemical production, leading the authorities to rush the planning of three petrochemical poles in a short period of time, and failure to give proper thought to the impact of the development on the human resources available. If they were built, at least, ten years apart one from another, there would have been more time for the exchange of ideas, experience, technicians, management staff and so on. As the development of each pole has begun at a point when the previous one had not achieved its mature status, the efforts to select, hire and train the manpower necessary for those poles are much higher. No proper advantage has been taken of the learning curve which could make sure that lessons from one development could be applied to the next.

The general characteristics of those industries lead them to cluster around oil refineries or, in highly industrial areas. This helps the understanding of the reasons why petrochemical industries in Brazil were organized in form of poles. Large industrial complexes benefit from the

backward and forward integration between oil and chemical industries, minimise the costs of transport and of very expensive and sophisticated installations, favours the standardisation and homogeneity of products and increases the advantages of having a continuity and stability of processes necessary to handle properly the fluid raw materials. The very nature of petrochemical industries, however, poses serious threats over the feasibility of the social objectives of the whole pole. As the petrochemical industries employ only a handful of highly skilled technicians and a few administrative staff, the NPP cannot be expected to play a major role in the solution of the ailing unemployment of the region. Therefore, the initial hypothesis that the basic complex of petrochemical industries at Camaçari could make a substantial contribution in the creation of new jobs must be doubted. The creation of those jobs will rely on the establishment of further industries, to be attracted by the availability of petrochemical feedstocks. These industries using semilabour-intensive, or even labour-intensive technology, could bring a significant number of jobs. The prospects for them to come, however, are not bright at all at present, which suggests that the government will have to create many incentives to encourage them to move in and establish themselves there. Furthermore, those transformation industries which have been set up are spread all over the region, what makes their impact look very weak.

Another important point would be the contribution in terms of products to the local community and to the region. This seemed not to have worried planners at any moment of the preliminary works of the pole, since they have made the projection of petrochemical demand at national and not at regional levels. Therefore, the products to be produced in the region obeyed the national demand and not the local needs. This means that the regional can increase even further its dependence on the South East of Brazil. The North East will continue as a simple raw material exporting area. The argument that exports benefit the whole community is beyond the

scope of this research, but the point that we need to stress here is that the region has not been taken as the main consumption market for the products. In the same way, no survey among the local industries has been made to assure their participation in future developments of the pole. It was an unbalanced planning. It might be expected that actions in that direction will be taken not to marginalize completely the local enterprises. The plans have not been made to decide how to move down to the lower rungs of the petrochemical production. They have been limited to the core, as is further explained in the next chapter.

The most serious problem of the NPP is the lack of priorities the transformation industry has received from the outset. The consolidation of the pole requires a change in the planning process with stronger backing for these peripheral units to come in, to grow and to overcome their main weaknesses - restricted quotas of feedstocks, prices policy which leads to rapid deterioration in working capital, a poor regional market and lack of experience in producing chemical products from petrochemical feedstocks.

CHAPTER 4: THE STRUCTURE AND MANAGEMENT OF THE POLE

#### 4.1. INTRODUCTION

This chapter studies the 'micro' - and 'macro'-organisation of the pole, that is, the internal relationship between the companies and the presence of the regional institutions, particularly governmental ones in the pole. The objective is to find out whether its structural organisation has been an effective tool for the attainment of the social and developmental goals of the region.

The chapter also deals with the 'macro-background' in which the sub-plan for the human resources of the pole is made.

#### 4.2 The Starting Point

The establishment of petrochemical companies in Salvador preceded the pole idea. In crude terms, we can say that the starting point was the discovery of oil in the region plus the existence of a large urban area, that made feasible the possibility of the industrial complex at Camaçari. During the sixties, some companies had established in the RMS, taking advantage of the available feedstocks from Petrobras.

Another important step was the report of the BID 'Banco Interamericano de De-denvolvimentol' economic mission at the end of the 60's (Viana Filho, 1970) which recommended the development of the petrochemical industries as a priority for the area. Afterwards, came the political decision to establish the pole at Camaçari. As far as the transformation industry of petrochemical products were concerned, there were scattered units spread in the major urban areas of the North East. There were also consumer-end industries, such as textiles, that used petrochemicals in small quantities as feedstocks. The policies of the implementation of the petrochemical pole had, then, an initial task to bring those industries together to operate in the area.

In effect, companies such as CIQUINE, BANYLSA, NITROFERTIL (ex-PETROFERTIL), FISIBA and SAFRON-TEIJIN in one way or another preceded the pole idea and were established exactly in the RMS.

Table n.4.1. Petrochemical companies and products in the RMS before the arrival of the pole.

COMPANY	PRODUCTS
Banylsa	Nylon, Polyester
Fisiba	Acrylic fibres
Nitrofertil	Ammonia, urea
Safron-Teijin	Polyester, Methanol
Paskin	Sodium Cyanide Methyl Metacrylate (Sulphate of Ammonia)
CCC	Carbon Black
Ciquine	Phthalic Anhydride

#### 4.3. THE CORPORATE STRATEGY

The initial idea was to have the control of the industry in Brazil which gave rise to PETROQUISA as seen in chapter three. As the Brazilian private sector is not sufficiently strong to face international competition, the government was the only one left to exert that control.

There was no doubt about the role of government in this particular development. How the government could exert that control was another matter that was dependent on several strategies it could adopt, regarding the composition of the companies, the level of control on private (multinational) enterprises or on the control of raw materials and commercialisation of the



products. A full intervention in the private sector was rejected for many reasons: in particular, it is not according to the government philosophy; it is not the appropriate strategy when the objectives are the attraction of new industries. It can be applied in situations where an already developed sector faces administrative or economic problems, or even when a newly developing industrial sector offers such advantageous opportunities that a selection of firms is required in order not to overcrowd the estate.

#### 4.3.1. The Tripartite Policy

As the petrochemical industries are largely dominated by multinationals and in the face of the general weakness of the domestic private sector, the road open for the shareholder composition of each company was expressed by a policy whereby each company should have one third of its shares owned by Brazilian private shareholders, one-third by a foreign partner and the last third by the Government. That is known as the tripartite policy, which has some tenets behind it:

- (i) the government decision that in order to strengthen domestic industry outside technology and capital are needed;
- (ii) fear that without Brazilian capital involvement, multinationals will satisfy neither the regional needs nor the requirements of national petrochemical industry;
- (iii) then, the necessity of an industrial scheme whereby some sort of control could be established on the multinationals without strangling enterprise by imposing the bureaucratic structures of government companies.

Table No. 4/2 - Relationship between Petrochemical Companies in the NPP  
and their main shareholders (% of total shares).

COMPANIES	S H A R E H O L D E R S		
	Government	Brazilian/Private	Foreign
COPENE/CEMAP	51.0	49.0 **	
ACRINOR	40.0	30.0	30.0
BASF	-	86.6	13.4
CIQUINE QUIMICA	-	100.0	-
CIQUINE PETROQUIMICA	33.3	33.4	33.3
CPB	-	100.0	-
CPC	33.3	33.4	33.3
COBAFI	10.0	90.0 *	-
COFENOR	-	75.0	25.0
CQR	98.4	1.6	-
DETEM	35.4	63.6	1.0
ESTIRENO	33.3	33.3 *	33.3
ETOXILADOS	-	100.0	-
FISIBA	38.0	33.0	29.0
ISOCIANATOS	49.1	39.6	11.3
MELAMINA	-	100.0	-
METANOR	33.4	66.6	-
NITROCARBONO	26.5	53.0	20.5
NITROFERTIL	100.0	-	-
OXITENO	-	100.0	-
POLIALDEN	33.3	33.4	33.3
POLIPROPILENO	30.0	40.0	30.0
POLITENO	30.0	40.0	30.0
PRONOR	49.9	50.1	-
BANFLSA	-	100.0	-
DOW QUIMICA	-	-	100.0
FAVAB	-	100.0 *	-
PASKIN	2.6	97.4	-
SAFRON-TEIJIN	-	68.0	32.0
SULFAB	12.1	87.9	-

SOURCE: COPEC

\* Private groups that, however legally registered in Brazil as private companies, are associated with foreign firms.

\*\* Users of the Products.

Diagram 4.1. The initial idea of the tripartite policy (shareholders' composition).



The corporate plan would be set up by a corporate committee.

How far this scheme can work will depend on the ability of the government to convince both partners of its healthy structure and also on the profitability prospects of the whole project.

#### 4.3.1.(a) The Reality in the NPP

An analysis of the actual shareholder composition of the firms in the pole shows that the tripartite policy did not work as smoothly as had been envisaged. This is a consequence of the following facts.

- (i) Multinationals have proposed to open subsidiaries where they have the majority of shares. That is the case with Rhodia Dow Quimica that are almost entirely owned by their parent companies.
- (ii) Large domestic groups from different parts of Brazil have decided to establish plants outside the guidelines of the three-third policy, generally to take advantage of the regional tax incentives.
- (iii) The government has actually accepted a lead-role in some firms, notably the CEMAP-Central of Raw Materials.
- (iv) Not all companies have three partners (regardless of the number of shares they hold).
- (v) Many foreign partners refuse to take an effective one-third of the shares.

Table No. 4/3 - Relationship between Know-how and Engineering Processes in the Field (Only the main products of each Company are considered).

COMPANIES	PROCESS LICENSOR	ENGINEERING PROJECT	ENGINEERING ASSEMBLY
COFENE/CEMAP	The Lummus Co.	Lummus Nedherland	National
ACRINOR	SONIO-Standard Oil	National	National
C.F.C.	Goodrich	Badger	National
	Mitsubishi	Japan Gas	
		National	
CI QUINE PETROQUIMICA	Mitsubishi	Scientific Design Co.	National
		Norden	
		National	
CI QUINE QUIMICA	Von Heyden	Mitsubishi	National
	Scientific Design Co.	Japan Gas	
COFINOR	Mitsubishi	National	National
DETEN	U.O.P.	-	-
ESTIRENO	Foster Grant	National	Technint
	Badger		
ISOCILINATOS	DU PONT	Lummus	National
		National	
ISOLANINA	Stamcarbon	Foster Wheeler	National
		National	
NEOMOR	ICI	National	National
NITROCARBONO	Stamcarbon	Chioda	Montreal
		National	
NITROFERTIL	Foster Wheeler	Kellog	National
	Mitsubishi	National	
	Kellog		
OXITENO	Scientific Design Co.	National	National
POLIALDEN	Mitsubishi	Kobesteel	Norden
POLITENO	Sumitomo	I.H.I.	National
		Foster Wheeler	National
POLIPROPILENO	ICI	SIM - CHEMICAL	SADE
		National	
PRONOR	Dynamit - Nobel	National	National
	INDUPLAN		
SULFAB	National	National	National

Source: Petroquisa

Obs.: Brazilian Firms are identified by the word National.

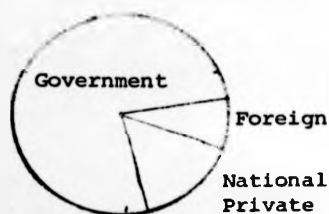
#### 4.3.1.(b) Control through raw materials

Theoretically, the firm which has the control on the provision of raw materials and key petrochemical products where there is a shortage of those products, has also a stronger position in the pole. Using this criterium the group Petrobras/petroquisa is the strongest in the pole, since it is responsible for the provision of organic raw materials and key petrochemical products through COPENE (diagram 4.1). Other feedstocks such as chloride, sulphuric acids are divided between Salgema, Dow and CQR.

The restrictions on Companies to exert a stronger government control are specially derived from the agreements all the firms sign when joining the pole. COPENE, then, is obliged to divide the output of each product according to the clauses of those agreements that do not allow a stoppage in the provision of stocks for a particular firm. In fact, it is not in COPENE's interests to create an atmosphere of uncertainty among the customers of feedstocks.

So, the control of raw materials and key products are not sufficient for an effective control of the pole, notwithstanding being an important element which can give those who handle them a strategic position. A restriction in this position is derived again from the technological problem. Even when government controls raw materials, the specification of each product, their quantities and combinations are made at the technical level. Therefore, the government through its own companies must supply according to prescribed standards, and according to demand so it loses even that level of control it had initially.

Diagram 4.2. Control derived from the supply of raw materials and key petrochemical products.

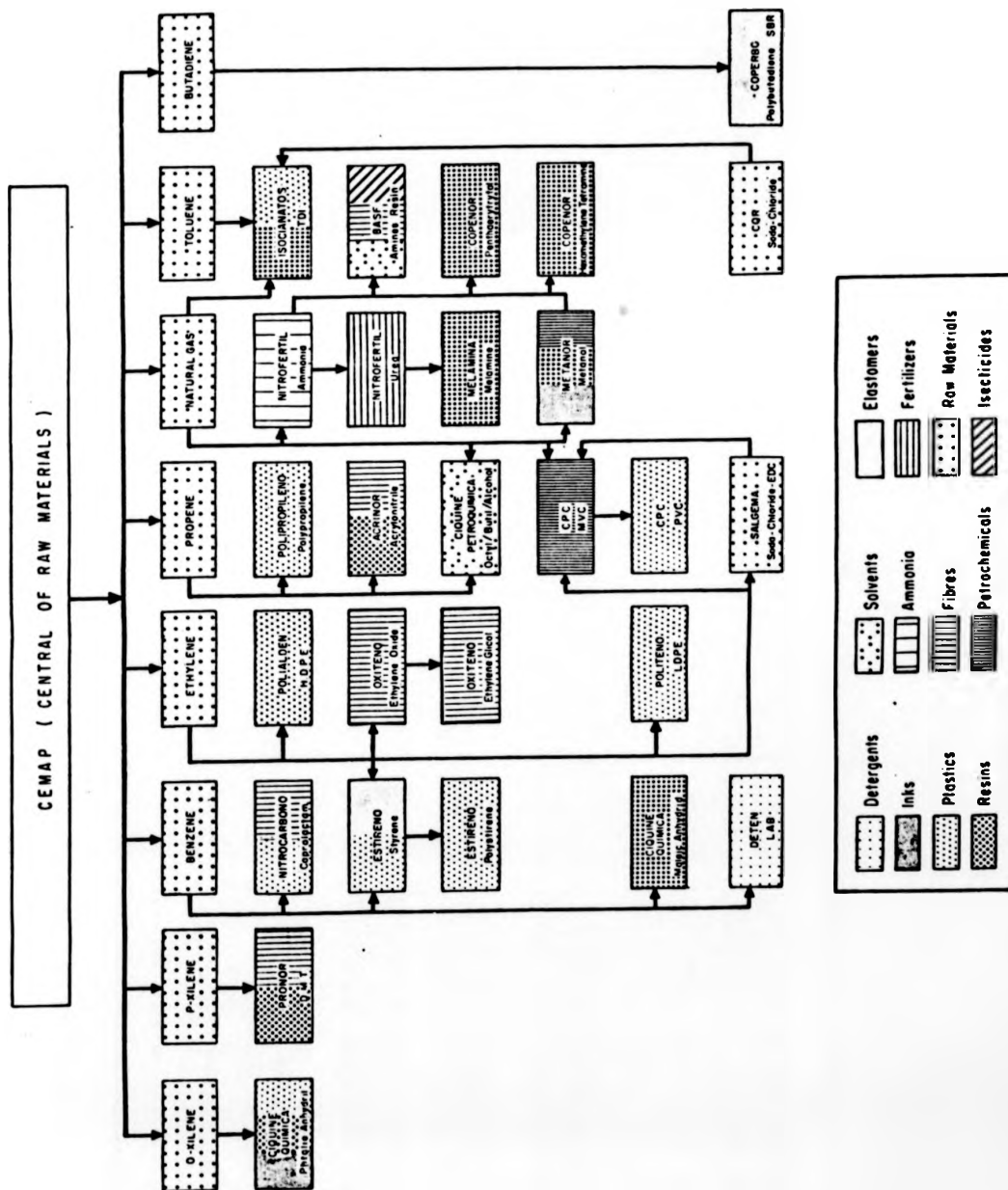


Theoretically, the government is the strongest partner, but its power is limited by the agreements it has to make.

Diagram No. 4/3 - The Central of Raw Materials.

## Raw Materials

## CONSUMING COMPANIES



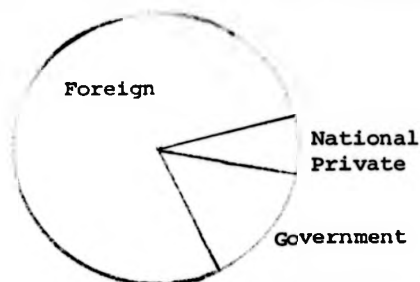
Another accepted trend behind that tripartite policy was the belief that the share owned by government and domestic companies could put the control of the pole in Brazilian hands by an alliance between both domestic partners. This, however, assures nobody any control at all. First of all, many domestic groups already have their linkages with foreign partners. Secondly, the vast literature on multinationals and sociological studies of capitalist groups in underdeveloped countries do not suggest that those groups would prefer to side with the government rather than with their foreign colleagues. So, the government has less power to control the activities of the pole than the scheme suggests beforehand. (Vernon, 1971, Pinelo 1973).

#### 4.3.1(c) Control through technology

The partner who controls the technical side (generally the multinational) has a vital element in his hands. Even if the other partners have an absolute majority of shares, they will not be able to set up a corporate plan by their own since they do not know the exact level of technology to be used in the manufacturing of the various products. As in the majority of companies the know-how belongs to a foreign partner, this alters the balance against the government control. Furthermore, as labour policies depend on the technology to be used, the foreign companies have a very important role to play in the planning of the human resources in the area. Of course, the technology to be sold is that already in use by the parent company in the developed country it comes from. There is no other way. First, if anyone wants to use other technology, he would have to create or to buy from another partner. So, the original advantages of having foreign partners disappear; secondly, companies may not have two technologies - one, for developed countries; another for underdeveloped ones. The technology a company uses is the one it knows and this is the one it will sell. That is the reason why the foreign partner in the NPP has also the task of on-job-training

programs for those technicians who will work in operation, maintenance and technical assistance to the customers.

Diagram 4.4. Control derived from the knowledge of the technology.



As the foreign partners have the control of technology, they also have a point of major importance in the planning process of the pole.

#### 4.3.1.(d) Administrative Control

As the government has the advantage of choosing the partners for a given enterprise through Petroquisa, in the majority of the cases, taking the initiative for a selected project and establishing a new enterprise and choosing the other partners, it can also pick up the foreign partner which offers more advantages to the project. Some limits to this selection are:

- a. There are only one or two foreign partners with the required know-how of the product to be made, and willing to go to the NPP;
- b. Many foreign companies (multinationals, especially) do not like to associate with governments and/or local enterprises.
- c. Many foreign companies have main policies to set up subsidiaries rather than accept joint ventures even with non-government organisations.

If the number of foreign companies wanting to move into the pole was high, let us say, about five companies for each project, Petroquisa would have freedom to opt for that partner whose technology better approached the requirements of the pole. Then, it could put some conditions over training of the staff and also the extent to which labour-intensive techniques



should be used in certain phases of the process, where capital-intensive technology was not absolutely necessary (see chapter two). However, this condition does not exist, for the simple reason that "beggars do not choose". There are also some indications Petroquisa was not interested in forcing a change of capital-intensive technology at this stage, since the objective has been the implementation of a highly competitive basic complex leaving freedom for the down-stream industries to set up other kinds of technology. But, even if a substitution is tried, the amount of capital that can be saved by employing labour will be very low due to the reason explained in chapter three. Saving between 5 and 10% of the whole investment is the figure likely to occur, according to some literature on this figure (UNIDO, 1976, Araujo JR, 1974, UNIDO, 1966a).

#### 4.3.1.(e) Relationship national/foreign technology and engineering process

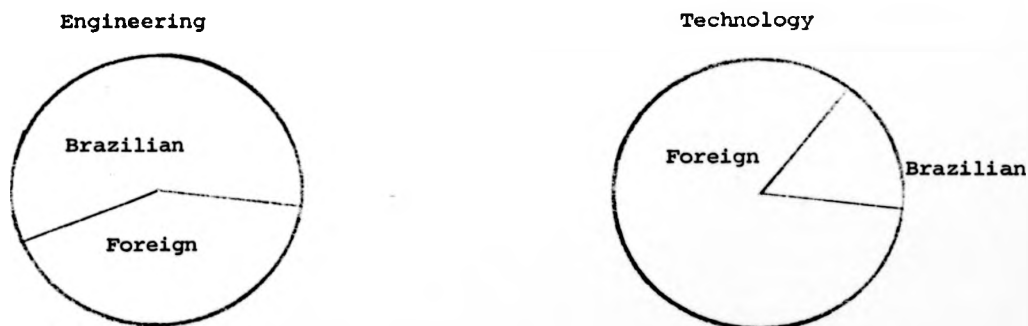
Table n.4.4. Growth of Chemical Industry and Purchases from Engineering Sector.

Discrimination	Percentages of growth			
Growth rate of National Economy (% per year)	2.0	4.0	6.0	8.0
Related growth rate of chemical industry (% per year)	3.3	6.6	10.0	13.3
Purchases of chemical industry on capital account from engineering sector (% of value of sales				
for expansion	3.3	6.6	10.0	13.3
for replacement	<u>8.0</u>	<u>8.0</u>	<u>8.0</u>	<u>8.0</u>
TOTAL	11.3	14.6	18.0	21.3

Source: The Chemical Industry, UNIDO 1969b).

The growth of the chemical industry is just the same as the related growth of the purchases of that industry on capital account from the engineering sector, considering only the values for expansion. The engineering sector is more important, however, on the replacement programs, which indicates the urgent need for countries acquiring new petrochemical technology to have the control of the engineering sector. Even, if the acquiring country manages to get control only of the engineering technology and not of the chemical process, it has already obtained a substantial share of the technological process. The implication on jobs is evident.

Diagram 4.5. Relationship national/foreign technology and engineering processes.



#### 4.3.1.(e) Appraisal of the tripartite policy

Ideal as it could appear, the tripartite scheme can be a simple juxtaposition and not an amalgamation or melting of forces. It is doubtful that a foreign partner owner of a specific know-how would be willing to hand it out in exchange for a minor participation in a joint venture. If this juxtaposition takes place, the company will have divided areas of influence among the partners with the technology to be used exerting a broad control on the operational activities. That is to say, they will have more power than they deserve as a shareholder.

Table No. 4.5.

## Firms of the NPPs: Main Products &amp; their destination, raw materials &amp; their origins.

(1) Firms of the Basic Complex.

FIRMS	MAIN PRODUCTS	MARKET	MAIN RAW MATERIAL	ORIGIN OF RAW MATERIAL
COPENOR (CEMAP)	ETHYLENE	Local	NAPHTHA	
	PROPYLENE	Local		
	BUTADIENE	National	NAT. GAS	Local
	BENZENE	Local		
	TOLUENE	Local	NAPHTHA	
	O-XYLENE	Local - 40% Nat.		
	P-XYLENE	Local - 40% Nat.		
	M-XYLENE	Local		
	AROMATICS 1	Local		
	NATURAL GAS	Local		
ACRINOR 1	ACRYLONITRILE	Local 70%	PROPYLENE	Local
	CYANURIC ACID	Local	AMMONIA	
CIQUINE QUIMICA	PHTALIC PLASTICISERS	National/Export	ETHYL ALCOHOL	
	MALEIC ANHYDRIDE	"	BENZENE	Local
	PHTALIC ANHYDRIDE	National/Export	O-XYLENE	
CIQUINE-PETROQUIMICA	2-ETHYL-HEXANOL	National	PROPYLENE	Local
	ISOBUTANOL		NATURAL GAS	
	BUTANOL			
CORAFI	NYLON-6	National	CAPROLACTAM	Local
C.P.B.	ACRYLIC RESINS	National	METHYL-METACRYLATE	Local
	OTHER RESINS		STYRENE	
			ACRYLONITRILE	
C.P.C. - Cia de Camacari	MVC		DI-CHLORIDE ETHANE	National
	PVC	National	ETHYLENE	Local
			CHLORIDE ACID	
COPENOR	PENTAPYTHRITOL	National	METHANOL	Local
	HEXAMETHYLENE		LIQUID AMMONIA	
	TETRAMINE		CAUSTIC SODA	
	FORMALDEHYDE			
CQR-	CAUSTIC SODA	Local - 90%		National
	CHLORIDE	Local - 90%	SEA SALT	
	HYDROCHLORIC ACID			
	SODIUM HYPOCHLORITE			
DETEN	LAB.	National	BENZENE	Local
			N-PARAFFINE	
ETOXILADOS	NONILPHENOL	National	ETHYLENE OXYDE	Local
	POLYETHYLENE GLYCOL		MONO-DIETHYLENE GLYCOL	National
ISOCIANATOS	TDI	National	TOLUENE/CHLORINE	Local/Salgema
			NAT. GAS	Local
MELAMINA	MELAMINE	National	UREA/	Local
MUTANOR	METHANOL	Local 75%	NATURAL GAS	Local
NITRO-ARRODO	CAPROLACTAM	Local 10%	BENZENE AMMONIA	Local
	SULPHATE OF AMMONIA	Local 5%	CAUSTIC SODA	
			SULPHURIC ACID	
OXITENO	ETHYLENE OXYDE	National	ETHYLENE	Local
	ETHYLENE GLYCOLS			
NITROFERTIL	AMMONIA/	Local 60%	Natural Gas	Local
	UREA	Local 25%		
POLIALDEN	HD POLYETHYLENE	Local 12%	ETHYLENE	Local
POLIPROPILENO	POLYPROPYLENE	Local 1%	PROPYLENE	Local

Table No. 4.5.

Firms of the MPP: Main Products & their destination, Raw materials & their origins.

(1) Firms of the Basic Complex.

FIRMS	MAIN PRODUCTS	MARKET	MAIN RAW MATERIAL	ORIGIN OF RAW MATERIAL	
COPENE (CEMAP)	ETHYLENE	Local	NAPHTA	Local	
	PROPYLENE	Local			
	ISOPARAFFINE	National			
	BENZENE	Local			
	TOLUENE	Local			
	O-XYLENE	Local - 60% Nat.	NAPHTA		
	P-XYLENE	Local - 40% Nat.			
	M-XYLENE	Local			
	AROMATICS 1	Local			
	NATURAL GAS	Local			
ACRINOR 1	ACRYLONITRILE	Local 70%	PROPYLENE	Local	
	CYANURIC ACID	Local	AMMONIA		
CIQUINE QUIMICA	PHTALIC PLASTICISERS	National/Export	ETHYL ALCOHOL	Local	
	MALEIC ANHYDRIDE	"	BENZENE		
	PHTALIC ANHYDRIDE	National/Export	O-XYLENE		
CIQUINE-PETROQUIMICA	2-ETHYL-HEXANOL	National	PROPYLENE	Local	
	ISOBUTANOL		NATURAL GAS		
	BUTANOL				
COBAFI	NYLON-6	National	CAPROLACTAM	Local	
C.P.B.	ACRYLIC RESINS	National	METHYL-METACRYLATE	Local	
	OTHER RESINS		STYRENE		
			ACRYLONITRILE		
C.P.C. - Cia de Canacari	MVC	National	DI-CHLORO ETHANE	National	
	PVC		ETHYLENE CHLORIDIC ACID 1	Local	
COPENOR	PENTAERYTHRITOL	National	METHANOL	Local	
	HEXAMETHYLENE		LIQUID AMMONIA		
	TETRAMINE		CAUSTIC SODA		
	FORMALDEHYDE				
CGR-	CAUSTIC SODA	Local - 90%	SEA SALT	National	
	CHLORIDE	Local - 90%			
	HYPOCHLORIC ACID				
	SODIUM HYPOCHLORITE				
DETEN	LAB.	National	BENZENE	Local	
			N-PARAFFINE		
ETOXILADOS	NONILPHENOL	National	ETHYLENE OXYDE	Local	
	POLYETHYLENE GLYCOL		MONO-DIETHYLENE GLYCOL	National	
ISOCIANATOS	TDI	National	TOLUENE/CHORINE NAT. GAS	Local/Salgema Local	
MELAMINA	MELAMINE	National	UREA/	Local	
METANOL	METHANOL	Local 75%	NATURAL GAS	Local	
NITROFARMACO	CAPROLACTAM	Local 10%	BENZENE AMMONIA	Local	
	SULPHATE OF AMMONIA	Local 5%	CAUSTIC SODA		
			SULPHURIC ACID		
OXITENO	ETHYLENE OXYDE	National	ETHYLENE	Local	
	ETHYLENE GLYCOLS				
NITROFERTIL	AMMONIA/	Local 60%	Natural Gas	Local	
	UREA	Local 25%			
POLIALDEN	HD POLYETHYLENE	Local 12%	ETHYLENE	Local	
POLIPROPILENO	POLYPROPYLENE	Local 1%	PROPYLENE	Local	

Table No. 3.5 (continued).

IV-14

FIRMS	MAIN PRODUCTS	MARKET	MAIN RAW MATERIAL	ORIGIN OF RAW MATERIAL
PROCTER	DMT	Local 100	P-XYLENE METHANOL	Local
POLITENO	LD-POLYETHYLENE	Local 60	ETHYLENE	Local
ESTIRENO - NE	STYRENE POLYSTYRENE ETHYLENBENZENE	National	BENZENE ETHYLENE	Local
HASF	MMA DMA DMF TMAC	Local 500 Local 170 Local 400 National	METHANOL AMMONIA CAUSTIC SODA HYDROCHLORIC ACID	Local
FISIBA	ACRYLIC FIBERS	National	ACRYLONITRILE ) SULPHURIC ACID ) METACRYLATE ) SODIUM NITRATE ) SODIUM METABISULPHITE	Local Imports
COPERBO (PERNAMBUCO)	POLYBUTADIENE STYRENE	National Local	BUTADIENE	Local
SALGEMA (ALAGOAS)	SODA CHLORINE	Local National	ALCOHOL ROCK SALT	Local

(11) Some Firms located in the REC but outside Camacari.

FIRM	MAIN PRODUCTS	MARKET	RAW MATERIAL	ORIGIN OF RAW MATERIAL
BAIYLSA	NYLON - 6 POLYESTER	National	CAPROLACTAM POLYESTHER POLYMERS	Local Import
CCC	CARBON BLACK	Local 100	AROMATICS RESIDES	Local
DOW QUIMICA	CAUSTIC SODA PROPENE OXYDE PERPYLENE GLYCOL CHLORINATED SOLVENTS	National Export Export National	PROPENE LIME BRINE LIME ) PHENOL )	Local Local National
PASKIN	METHYL METACRYLATE SULPHATE OF AMMONIA SODIUM CYANIDE	National	METHANOL SULPHUR AMMONIA ) NATURAL GAS ) CAUSTIC SODA )	Local Import Local
SAFRA	POLYESTHER METHANOL	National	DMT MEG	Local

Source: COPEC.

Table No. 3.5 (continued).

IV-14

FIRMS	MAIN PRODUCTS	MARKET	MAIN RAW MATERIAL	ORIGIN OF RAW MATERIAL
PRODAM	DMT	Local 10%	P-XYLENE METHANOL	Local
POLITENO	LD-POLYETHYLENE	Local 6%	ETHYLENE	Local
ESTIRENO - NE	STYRENE POLYSTYRENE ETHYLBENZENE	National	BENZENE ETHYLENE	Local
BASF	MMA DMA DMP TMAC	Local 50% Local 17% Local 40% National	METHANOL AMMONIA CAUSTIC SODA HYDROCHLORIC ACID	Local
FISIBA	ACRYLIC FIBERS	National	ACRYLONITRILE ) SULPHURIC ACID ) METACRYLATE ) SODIUM NITRATE ) SODIUM METABISULPHITE	Local Imports
COPERBO (PERNAMBUCO)	POLYBUTADIENE STYRENE	National Local	BUTADIENE	Local
SALGEMA (ALAGOAS)	SODA CHLORINE	Local National	ALCOHOL ROCK SALT	Local

(11) Some Firms located in the RMG but outside Camaguri.

FIRM	MAIN PRODUCTS	MARKET	RAW MATERIAL	ORIGIN OF RAW MATERIAL
BANYLSA	NYLON - 6 POLYESTER	National	CAPROLACTAM POLYESTHER POLYMERS	Local Import
CCC	CARBON BLACK	Local 10%	ARAMATICS RESIDES	Local
DOM QUIMICA	CAUSTIC SODA PROPENE OXYDE PERPYLENE GLYCOL CHLORINATED SOLVENTS	National Export Export National	PROPENE LINE BRINE LIME ) PHENOL )	Local Local National
PASKIN	METHYL METACRYLATE SULPHATE OF AMMONIA SODIUM CYANIDE	National	METHENOL SULPHUR AMMONIA ) NATURAL GAS ) CAUSTIC SODA )	Local Import Local
SAFRA	POLYESTHER METHANOL	National	DMT MEG	Local

Source: COPEC.

This fact is the result of the weakness of the Brazilian partners, who are in the projects due more to government incentives rather than to their own merits and to the knowledge of the appropriate technologies. This is better understood by the analysis of the financial scheme used in the pole.

Taking the source of the funds used by those companies, we can verify that the state is responsible for 78% of the total investment. The outstanding 22% being divided between the three partners of the pole, including the government as a shareholder. As the foreign partner sells his technology to the new company in exchange for shares, his cash participation is even less than the theoretical 7% that is reserved for him. In other words, Brazil is responsible for more than 9/10 of the investment made at Camaçari.

As the true philosophy behind the tripartite policy is in the last analysis a compromise policy between nationalisation and private enterprise, this dilemma cannot be solved by the industrial management, but it involves a more profound understanding by all partners of the nature of the economic structure that is being built in Brazil. Notwithstanding, that the NPP is intended to strengthen the Brazilian private sector, its presence at that site does not seem to have had much influence on this aspect up till now.

Anyway, as technology does not come alone but needs a whole structure of Assembly Engineering companies and detailed projects firms, a great improvement would be to make Brazil share a greater proportion in the implementation of these industrial plants. Here comes an obstacle related to the selling of technology. It is very usual for a given know-how to be sold with the specification of the firm that has the knowledge to put it into operation. The engineering firms which will work on the Assembly or on detail projects are already locked up inside these licensed technological packages. As there have been more than one country buying these technologies, a possible solution is to widen the basis of these engineering

firms by international agreements with other Third World customers of the same services and with a significant petrochemical development program such as Argentina, Mexico and so on (section 3.5.3).

Nevertheless, further hope of strengthening the private sector can lie only in the development of the down-stream industries as seen in section 3.9.4.

We may conclude this section by saying that the tripartite scheme has neither proved to be an effective instrument to bring foreign investment to the country, nor it has a reliable tool to strengthen the private domestic sector in petrochemicals (4.2.1(a)). An important question, then, has to be made here. If with the tripartite scheme, the country is responsible for more than 90% of the investment, why not employ the outstanding 10% left to buy the processes required for the pole or to guarantee technical assistance from different sources? It is clear that such a suggestion should be preceeded by a thorough analysis of the availability of those processes and the willingness of their holders to sell them. Anyway, what must be clear is that the tripartite policy should be improved as a guarantee of a better participation of the Brazilian sector on the technical operation of the pole and to bring more investment from the foreign partner for these industrial efforts.

#### 4.4. THE ORGANISATION STRUCTURE

As there are many institutions which have worked for the NPP and are related to different levels of government or to the private sector, the following headings study the way the pole works and its relation to the previously mentioned institutions. There is no attempt to cover all the governments bodies at Camaçari, but only those with which we have dealt in this research.



#### 4.4.1. The Federal Government Presence

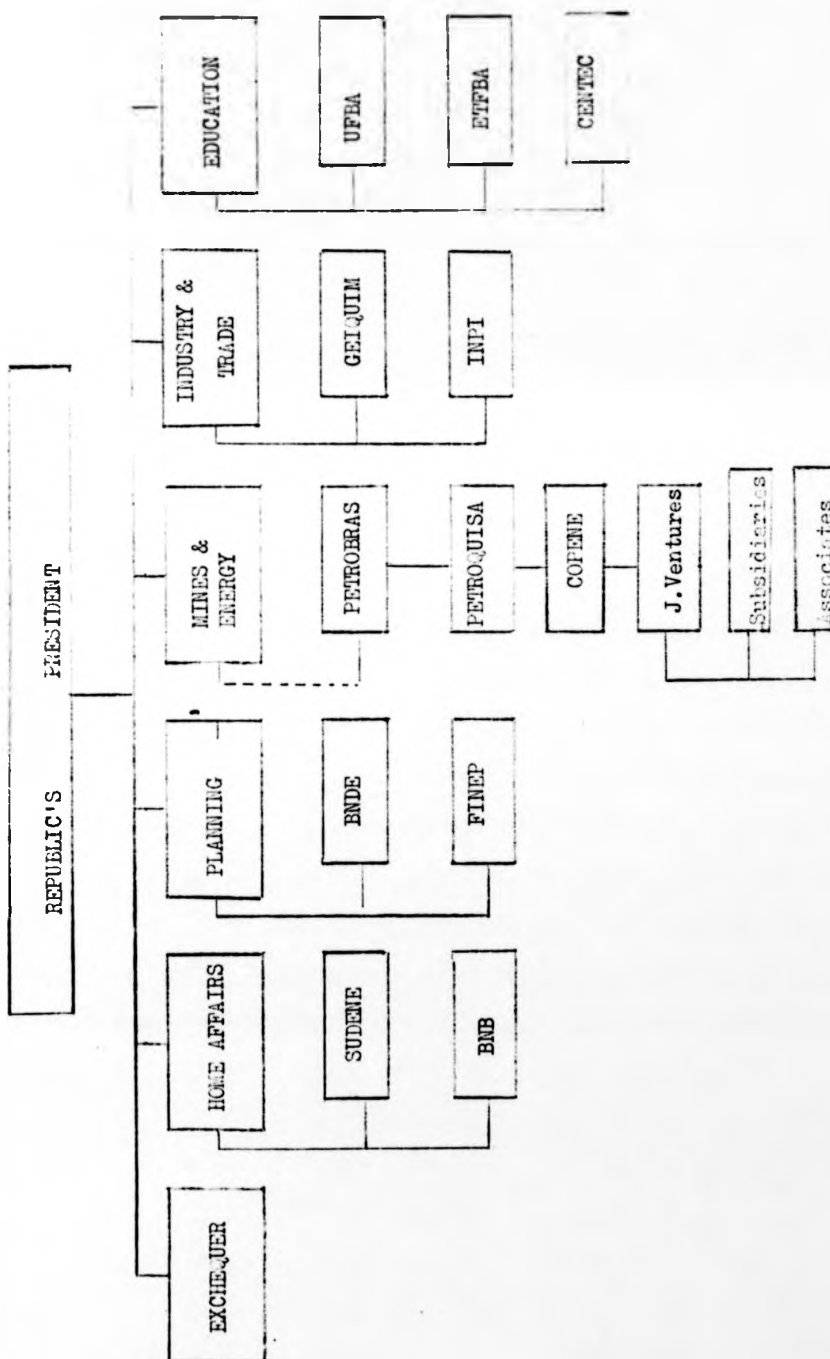
As a national priority the NPP has been mainly a Federal Government project with strong regional support (chapter one/two). The Federal presence is made mainly by the financed institutions and by the State-owned co. Petrobras (Petroquisa/COPENE). There are however, many other Federal bodies with an effective contribution for the development of Camaçari, such as GEIQUIM, SUDENE, GTFBA (Escola Tiomica Federal), UFBA (Uniconidade Federal da Bahia), CENTEC, GEIQUIM, INPI & FINEP, that are attached to different Federal Ministries (see diagram 4.6). The only coordination of the Federal services is made by Petroquisa/COPENE for the industrial aspects of the project.

#### 4.4.2. The State Government Presence

As seen in chapter two, the state government has worked to get the Federal government to set the pole at Camaçari. The BID mission was an initial indication of this policy. Further on, it has implemented a set of policies aimed at encouraging firms to move in (tax incentives) and has undertaken a wide infrastructure program at that site (6.3). The state secretariats for Labour and Social Welfare, Mines and Energy, Planning and Industry & Commerce were particularly busy at the project. The coordination of the state works for infrastructure development was headed by COPEC, which has also a section responsible for contacting new firms intending to enter the pole.

Similar to the Federal sphere, the efforts here were channelling towards engineering works generally connected to the infrastructure works of the pole. As the building up went on, the pressure to get the down-stream industries was felt. A company called Propar aiming at attracting potential entrepreneurs and other companies to Bahia and particularly to the NPP was

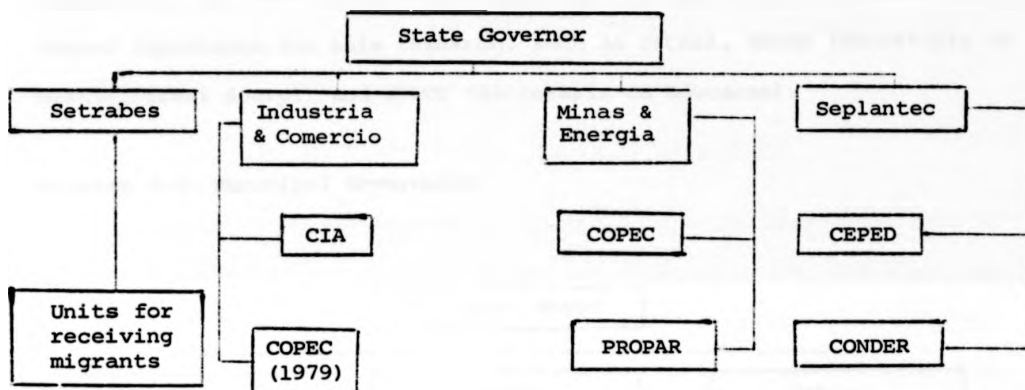
Diagram No. 4/6 - The Federal Government Presence in the NPF



(For further details of these organisms, see section 4.3.5)

founded in 1978, many years behind the beginning of work in the pole.

Diagram n.4.7. The State Government Presence.



(see section 4.3.5)

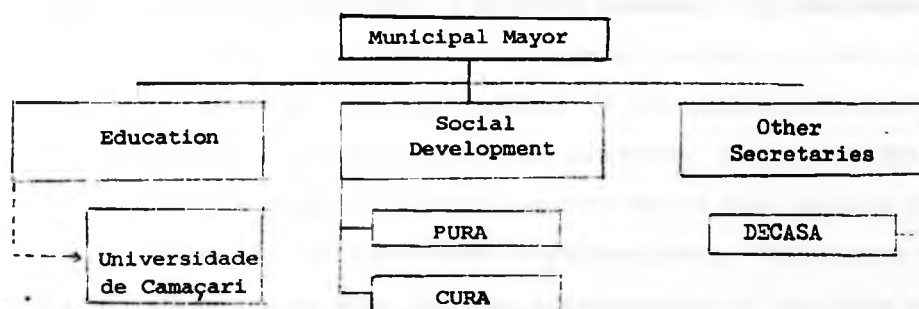
Even, the establishment of Propar was not sufficient to provide all the services a pole needs to have. As the linkage network of industries is an essential feature in any pole (section 2.2.) the implementation of the NPP should have both infrastructure works and a managerial commitment to get the already existing companies and entrepreneurs to join the pole. Fortunately, the lack of local participation has been avoided in the implementation of the Third Pole. There, industrial and commercial firms with links to the petrochemical industries have already set their lobby group to have a say in the planning of the pole. It is very early to forecast the outcome of the Third Pole, but, at least, this is a much better start.

#### 4.4.3. The Municipal Presence

The pole has changed the face of Camaçari in all aspects - social, political, economic and administrative (section 6.5. and for further details). It was not, however, a force behind the start of the pole, but its receiver. Today, Camaçari and the pole are two completely

interlinked entities. The advent of the pole has also forced the Municipal Government into a complete administrative reform so that initially the entire Municipal machine is geared towards that industrial complex or as a function of it. There are some sections of this Municipal Government with utmost importance for this research, such as DECASA, SEDES (Secretaria de Desemvolviment Social) and SEDUC (Secretaria da Educacao).

Diagram 4.8 Municipal Government



(see section 4.3.5).

The performance of the Municipal government is fully analysed in chapter six. One point, however, can be anticipated here. Similar to the Federal and State Government, there is no attempt by the Municipal Authorities to get suggestions from prospective commercial and industrial firms during the building up of the pole. Moreover, there is a lack of coordination among so many entities working at the site. The pure division of works among COPENE (Industrial building up), COPEC (the industrial estate area) and Municipality (works outside COPEC area) does lack the integration component so important in this kind of large scale industrial complex. An attempt for this coordinating effort was made with COMCOP (coordination of Camaçari Petrochemical Pole) a body integrated by several state secretariats and the Mayor of Camaçari, but with neither power nor financial resources

to implement its decisions. It has only consultative duties, which does not fall in line with the experience drawn out from other industrial estates around the world and from these massive industrialization programs in one-single area suggesting that the coordinating organization must have sufficient power and funds to carry out its responsibilities. (Merlyn - 1971, HMSO - 1974, de Oliveira, 1977).

#### 4.4.4. The Organisation Structure of the NPP

Chapter three has emphasised the concentration characteristics of the petrochemical industries. A previous diagram - 2.3. has shown the main inter-relationships between the firms in the pole, in which some industries are almost entirely dependent on that complex both for their feedstocks and for the selling of their products. The last column on the right of the diagram indicates applications of some products and also new fields for the down-stream entrepreneurship. The diagram 2.3. confirms close concentration and the interdependence of the firms as seen in chapter three.

This interdependence, however, does not mean a close linkage to the local economy. If we look back to table n.2.7. that shows the destination of the total output of the pole, we realise that the proportion of products being sold in the regional market is very low which weakens the structure of an ideal pole in Perrouxian sense.

#### (a) Petroquisa & COPENE

Due to Petroquisa's role as the leading petrochemical company in Brazil (and its subsidiary COPENE in the NPP) and to the fact that firms inside the pole have it as a partner, this section makes a brief reference to both companies.

Diagram 4.9. Petroquisa Structure

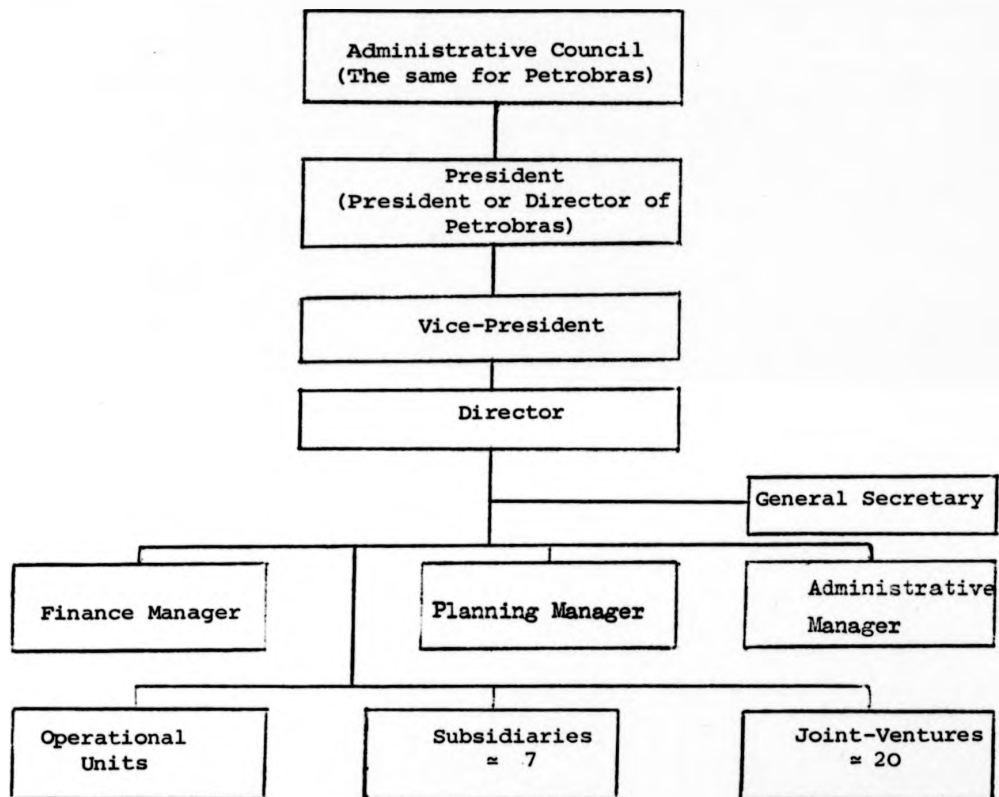
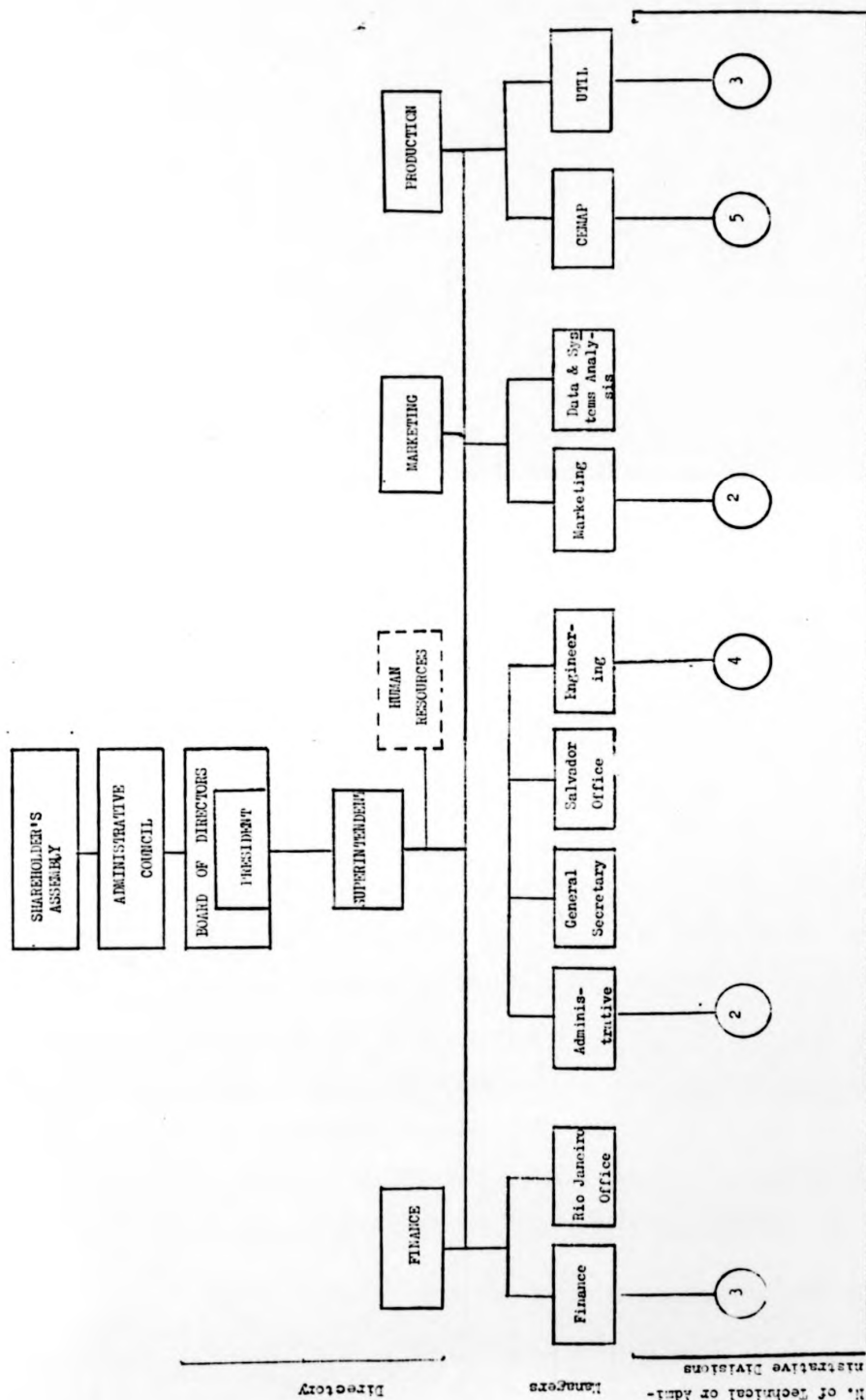


Diagram n. 4/10. COFFE'S STRUCTURE

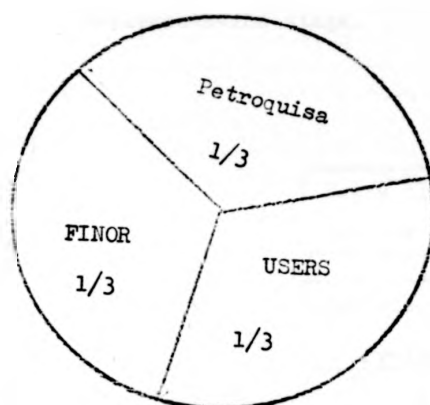


Source: COFFE

A Temporary Office for Human Resource Policy Advice to the Superintendent Director.

Copene administrative council has an equal number of representatives from Petroquisa, the government, the users, plus a representative from BNDE which can be explained by the origins of its financial resources.

Diagram n.4.11. Origin of COPENE'S Resources



(iii) Other Companies' Structure

Some companies in the pole are still in the process of installation, so they do not have a definitive structure yet. Others are in the first years of operation which is not sufficient to consolidate their structure. Administrative structure is not a permanent scheme, of course, but a philosophy behind a given administrative hierarchy has to be well established even to get the necessary changes.

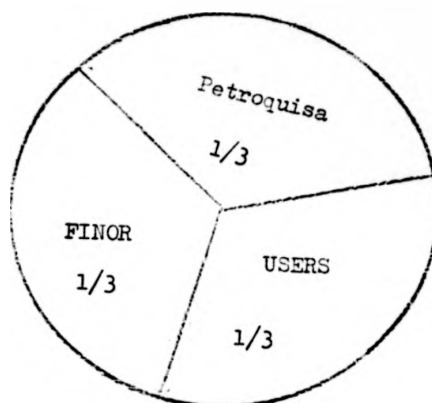
IBP has proposed the following strategies for a petrochemical company in the implementation stage and at the operational phases.

The research has shown that the actual structure of the companies in the NPP are similar to the one proposed by IBP. Most of the companies, however, lack a highly placed officer or Director for human resource planning or development, that is, they do not have a director for that function at the same hierarchical level as for Finance, Sales and Production. Two



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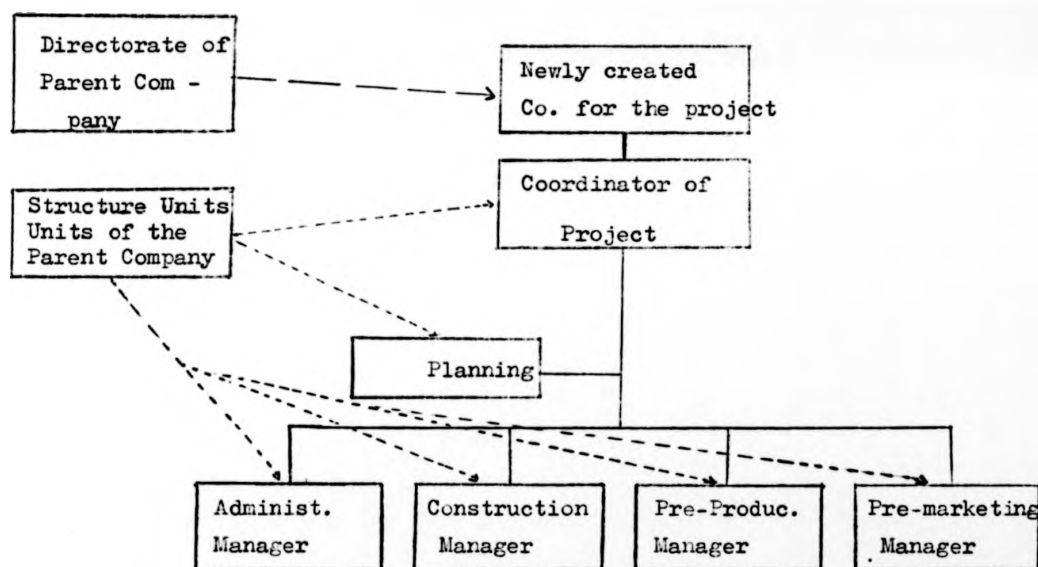
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exceptions were DOW Quimica (outside Camaçari) with a high level Director for planning and Safron-Teijin (both at CIA), with a Director for Industrial Relations.

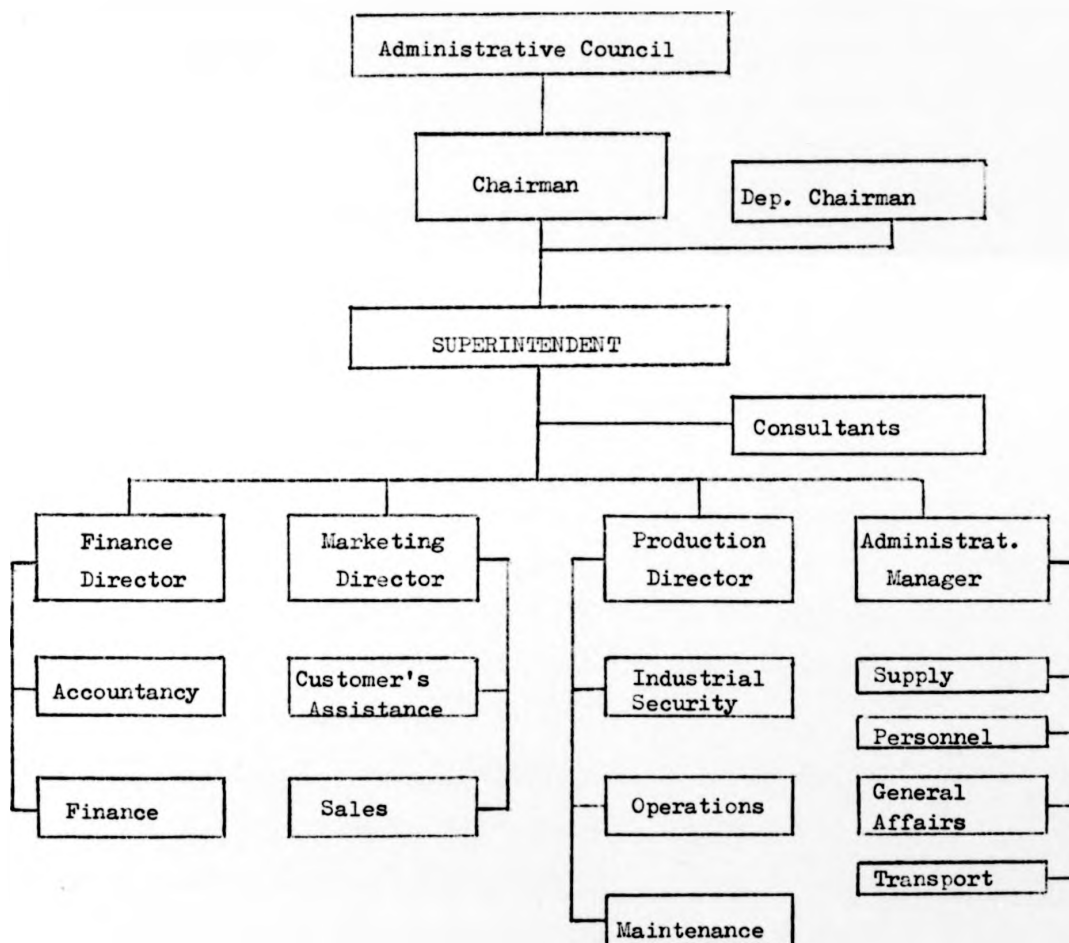
Diagram No. 4/12 - Organisational structure for petrochemical plants in implementation stage.



(Adapted from IBP's proposal )

These findings do not fall in line with the expected policies towards the development of human resources. In effect, the major aims of an organisation are likely to reflect in its administrative structure. It seems a bit contradictory defining the development of the regional labour force as a major goal and not having a Director for Personnel or Industrial Relations or manpower planning in the upper rungs of the hierarchy.

Diagram N. 4/13 - Model of Structure for Petrochemical Companies in the NFP.



#### 4.4.5. Institutions working for the Pole

This section is a summary of the previous one and intends to see who does what in the pole, independently of its classification as a government or private institution.

- (i) COPEC is the portuguese initials for the Committee of the Petrochemical Complex of Camaçari. It also means a 243 Km<sup>2</sup> area reserved for all the units of the pole in the Municipality of Camaçari. The Committee is a State Body subordinate to the State Secretariat for Mines and Energy. It is responsible for the implementation of the policies established in the Master Plan.
- (ii) COMCOP - Comissao Coordenadora do Complexo Petroquimico (Coordinating Commission of Camaçari Petrochemical Complex) is a body integrated by the several State Secretariats and the Mayor of Camaçari, under the Coordination of the Secretary for Mines & Energy. Its functions are the leadership and a coordination of the policies of the different Government bodies at Camaçari.
- (iii) PETROQUISA - Petrobras Chemical - is a subsidiary of the State owned oil company that operates in the development of the national petrochemical industry.
- (iv) COFIC - Committee for Industrial Promotion of Camaçari - is integrated with entrepreneurs of the petrochemical plants.
- (v) CEPED - Research and Development Centre - under the State Secretariat for Planning is responsible for the supply of technological support to the petrochemical activities in Bahia.

- (vi) CENDRO - Centre for the Development of Organisational Resources - is a CEPED's Unit, responsible for promotion of training courses, seminars, research and kindred activities for the development of the regional enterprises.
- (vii) PROPAR is a State of Bahia company in charge of promoting the growth and establishment of new industries in Bahia.
- (viii) SUDENE Federal Agency attached to the 'Ministerio do Interior', responsible for overall planning in the whole North East, including Bahia.
- (ix) BNDE - The National Economic Development Bank is the main financial source for investments and loans to the pole.
- (x) GEIQUIM - A Department of the 'Ministerio da Industria' in charge of the development of the chemical industry in Brazil. It studies the requirements for the establishment of new industries, proposing or reducing the incentives.
- (xi) INPI - is also attached to the 'Ministerio do Interior' and is the National Institute for the regulation of patents and industrial licences.
- (xii) UFBA (Universidade Federal da Bahia)  
CENTEC (Centro Tecnologico da Bahia)  
ETFBA (Escola Tecnica Federal da Bahia)  
all of them under the 'Ministerio de Educacao' are organisms for education and training at the University and lower level.
- (xiii) CENPES is the Petrobras Research and Development Institute. It had a section called CENPEQ in Bahia.
- (xiv) BN (Banco do Nordeste) a bank under the 'Ministerio de Interior' created to coordinate the Federal Government investments in the NE.

- (xv) FINOR is a scheme to distribute funds derived from tax incentives (deduction) made on the income tax of individuals and enterprises in Brazil to firms setting branches in the NE . It is jointly administered by SUDENE and BNB.
- (xvi) CONDER - A state of Bahia company in charge of development plans for the Metropolitan area of Salvador.
- (xvii) DECASA - A Municipality of Camaçari owned company in charge of the housing programs for Camaçari.
- (xviii) PNTE/CEBRAE - Federal organisation designed to back Managerial development programs, usually for the small and medium companies.
- (xix) State Secretariats with straight relationship with the development of the pole:
  - Setrabes (labour and social welfare)
  - SME (Mines and energy)
  - SIC (Industry and Commerce)
- (xx) SEDES (Local government secretaries: Secretariat for Social Development) It had worked firstly with the 'Ministério do Trabalho' (Labour) in the program for reception of migrants at Camaçari. It has also undertaken two projects PURA (Projects of Guided Housing of Camaçari) and CURA (Project of Urbanisation and Preparation of areas) which have been analysed in chapter six (section 6.6.1).
- (xxi) SEDUC (Secretary for Education). It has responsibility for education at the Municipality and is working on a project for the 'University of Camaçari'.

The complexity and interlocking or overlapping nature of these many agencies is hardly likely to operate effectively without some rationalisation and very careful coordination based on well understood policies agreed by all.

#### 4.5. The Corporate Sub-Plan for the Human Resources

##### 4.5.1. The Labour Function

It is widely accepted that the labour cost of any industrial plant is an equation similar to the production function. It relates labour costs to annual scale of production and can be expressed by

$$\frac{X_0}{X_1} = \left( \frac{P_0}{P_1} \right)^f \text{ being } 0 \leq f \leq 1$$

where,

$X_0$  and  $X_1$  = direct labour costs engaged at two different plant capacities;

$P_0$  and  $P_1$  = two different plant capacities;

$f$  = elasticity of the cost of labour in relation to the scale of installed capacity. In other words,  $f$  represents the relative change in  $X$  derived from an increase or decrease in  $P$ .

If we make  $X$  equals capital related to the same annual output  $P$ , we would have the function of capital costs. ' $f$ ' then represents the elasticity of fixed assets.

An authoritative study by Vietorisz (UNIDO, 1969 b) estimates that the value of ' $f$ ' is known for each chemical process on the basis of work experience. For labour costs, it lies generally in the interval 0.2 - 0.4, but it can also go higher as in the example quoted below (diagram 4.17), relative to the production of ammonia. This labour cost equation, however, is not valid for whatever increase in production may exist, but is expected that when  $P_1$  is much higher than  $P_0$ , that is when it goes beyond the range of economies of scale, adjustment in the labour function may be necessary

(see UNIDO, 1969b; Isard, 1959, CLAN/CONDER w.d.). Even so, the range of economies of scale in petrochemicals is very wide, whence the trend to build higher capacity plants.

An illustrative example is quoted by Vietorisz using data for the production of ammonia and including observed non-linear values (INPUT) related to investment, labour and supervision per shift.

	Plant Capacity (tons per day)	Input
<u>Labour</u>		
Workers per shift	100	7
	200	10
	300	12
	<u>500</u>	15
Supervisor p/shift	50 to 200	2
	over 200	4
	(tons per year)	
<u>Investments</u>		
(millions of dollars)	36,000	5
	108,000	11
	180,000	16

The inputs were worked out for those values which expand proportionally as production grows. There are other factors, however, such as indirect labour that could be added afterwards as a percentage of the direct costs.

In this exponential function with a low elasticity exponent, the increase in the total output has a small response in the total increase in labour costs. In fact, the exponent for most petrochemical products are smaller than that shown in the diagram. The vertical dotted lines in the diagram show the limits within which the function is likely to work, that is, the limits within which economies of scale are likely to appear. (Diagram n.4/15).



The labour cost of a low capacity plant is the same or even bigger than the cost of a higher capacity plant operating under its full capacity inside its range of economies of scale. With the higher capacity plants, it is also possible to lower unit labour costs by increasing output to installed capacity, where the output can be sold. The tendency, then, is to install plant capable of output well beyond current demand with each new installation creating potential surplus of output at least until demand catches up. This is probably the main reason for the increasing plant capacities of petrochemical plants in the world and also for the world over supply of some chemical products (olefins), as each operator seeks to work his plants at the optimum level and build them with the most economical capacity.

In fact, the increase in plant capacity has lowered significantly the labour costs in petrochemicals. Again, UNIDO (1966) compares labour costs at different plant capacities.

Product	Labour Costs (% of the total costs)	
	Small	Large
Ammonia	10.3	1.6
Methanol	9.3	1.5
Acetylene	7.8	3.9
Urea	11.1	4.4
Ammonium Nitrate	9.8	4.2
Acrylonitrile	8.1	5.2
Vinyl Chloride	5.3	2.3

This labour cost today tends to be an even lower percentage, due to the growth in plant capacities and to the increases in the total costs of fixed investment (equipment, mainly).

Supervision is also very low in these highly capital-intensive plants due to the fact that a ratio highly skilled-employee to supervisors tends to be low. Labour intensive industries use more supervision down to the lower echelons of the organisation (Woodward, 1965, Minzberg 1979). In the diagram n.4.17, the supervision line is plotted against the lower points of the range given in the UNIDO's table. Similar to indirect costs, supervision can also be calculated as a percentage of the direct costline (INPUT).

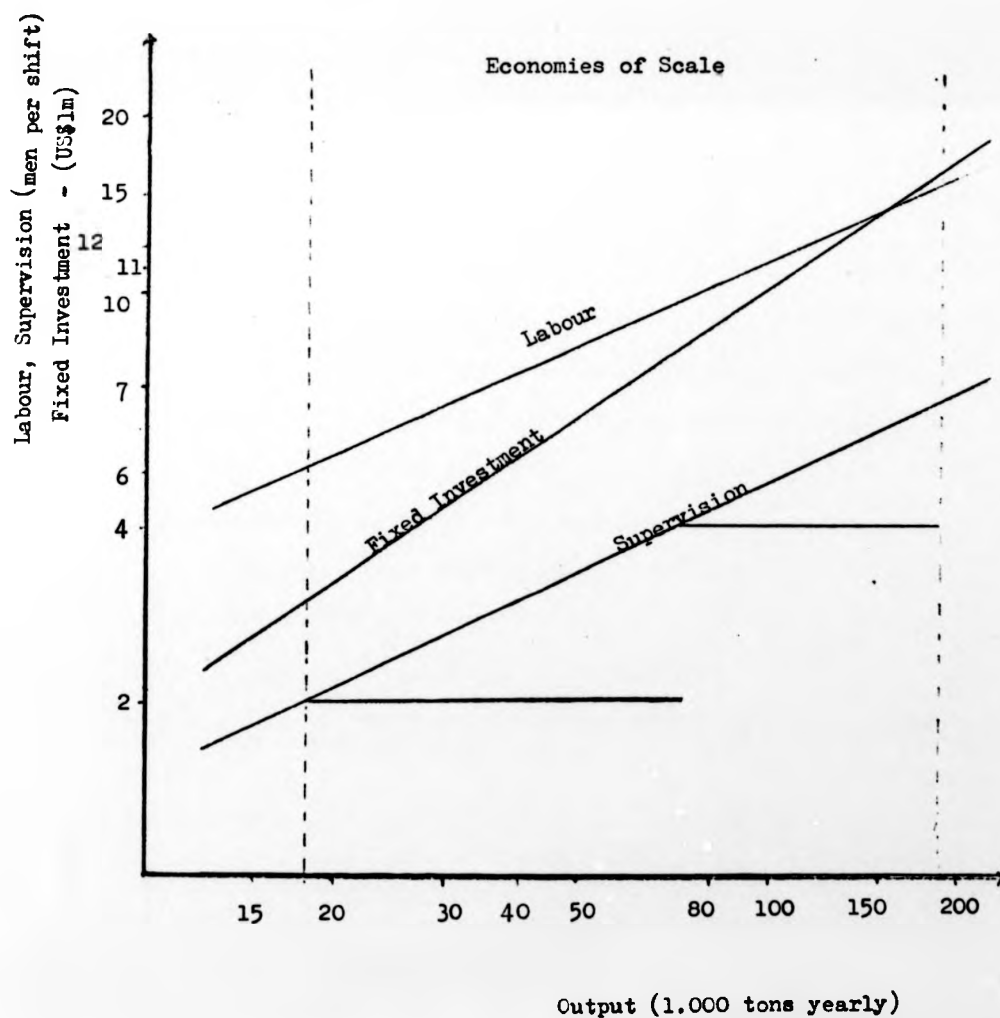
It is valid to state here that the main savings in these economies of scale are not derived from the labour function (even due to the small slope of its line) but from the fixed investment. That is one reason why the construction of small capacity plants in underdeveloped countries even with small markets is not advisable. In the same way, a high capital labour cost ratio is as undesirable as a high capital output ratio.

Then, it is not economically sensible to build small petrochemical plants even when initial markets are small. The strategy of the NPP is building capacity plans in line with this function.

(Diagram No. 4/15 overleaf)

Diagram No. 4/15 - Labour and Supervision Men per shift.

(Economies of Scale for a plant of  
ammonia)



Source: UNIDO 1969b

#### 4.5.2. Background for the Human Resources Plan

The corporate plan for the human resources can be divided into two parts (a) a Internal Corporate Plan and (b) an External Corporate Plan or the Corporate Plan for the Community (see chapter six).

##### 4.5.2(a). Internal Corporate Plan

Any corporate plan intending to develop the human resources must keep in mind the points raised at section 4.4., in the first place. Due to the nature and objectives of the NPP, there are other points which deserve careful study for the overall policies and more particularly for the human resources policies:

- (i) Regionalisation of the labour force - As have been previously stressed the objectives are for a greater participation of the local human resources. Some processes such as the ancillary activities, which are not closely related to the technological operations, can be extended fully to the local population, which can be an initial priority. With the development of the pole, an integration of local labour at all other areas can be progressively extended.
- (ii) Choice of the plants for the basic complexes - As seen in chapter 3, the choice of those plants were in full accord with national priorities and the particular characteristics of the petrochemical industries, but did not face the primary needs of the region, so, besides the efforts described in the previous paragraph, there must be found a way to correlate any products or by-products of that complex to the regional development.

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- (iii) Social overheads - The compact location of the NPP makes room for the development of common services and the sharing of social overheads or even an agreed general policy in such fields as transport, communications and provision of facilities for the community. The subsidies the pole gives to the transport of employees to and from the surrounding towns can be substantially diminished, if it transfers a percentage of those subsidies to back a housing program at Camaçari for instance.
- (iv) National Technology - Although technology is a subject that stretches far beyond the frontier of human resource planning it is clear that it is closely related to it. There is not technology transfer without a skilled and trained basic labour force to accept the transfer. A long term plan should be designed aiming at the acquisition and learning of new technology. Special care should be taken to avoid contracts that do not enable the domestic partners to learn the skills necessary to the operation of the whole plant. In this way, operations such as the "turn-key" contracts should be shunned. Policies intended to strengthen the local research and development institutes must be envisaged and measures to relate the purchase of equipment and technology to the training of the HR taken.
- (v) Organisation and Structure of the NPP Because of the way it is organised, there is no possibility whereby a single company or institute could set a corporate plan for the whole complex on its own (section 4.3). However, COPENE is undoubtedly the best placed organisation to lead a common program for the development of human resources. As a subsidiary of Petroquisa which is necessary partner in many companies in the NPP, it may also suggest

to other enterprises the importance of such a development.

In summary and as a result of the previous points, all the enterprises have to get together to find a common ground for the training of their management, professionals, skilled and semi-skilled workers. Otherwise, if the companies just want to fight for the best man-power in a scarce market, without putting extra effort to training their own labour force they might possibly find themselves with insufficient labour to fight for.

Moreover, as the companies are interdependent in many fields (chapter three), they should have common industrial relations policies, whereby they were agreed at least on the policies towards selection, training and development. Remuneration is also a fertile field for cooperation.

As the policies for the human resources are likely to be different for each category of labour in accordance with their skills and with demand and supply, this subject is then broken into the following categories; which are thoughtfully analysed in chapter five;

- a.1. ENTREPRENEURS - As seen from the 4.3., there is initially no participation of the local entrepreneurs at the basic complex in the NPP.
- a.2. MANAGERIAL STAFF - Petrochemical companies are understood to save on management due to their capital intensive characteristic and to the fluid nature of some of their processes (section 3.4.). Mintzberg (1973) and Mrowetz (1973) have also studies backing this point. Due to the lack of local experience in petrochemistry, the region is not expected to be able to offer great support in this category, especially on the subjects related to the technological aspects.
- a.3. PROFESSIONALS AND TECHNICIANS - These are the people who would carry the main tasks of absorbing the new bought-in technology. Even if the demand for them can be met by the market, they can still be a problem. Due to the importance of their responsibilities, the strategic importance

of this group is better measured by the quality rather than the quantity the market can provide.

- a.4. SKILLED AND SEMI-SKILLED WORKERS - A very wide gap is expected between the demand and supply of these workers, due to the previous non-existence of petrochemical industries.
- a.5. UNSKILLED LABOUR - Based on chapter one, we can affirm an excess of supply over demand here. High unemployment in this sector might turn out to put strong political pressure over the labour policies adopted in the NPP. Due to its nature, this is studied in conjunction with the local community in chapter six.

#### 4.4.2.(b) The Human Resource Policies and the Community

Chapter one has studied Camaçari at the time of the arrival of the pole. As a small town that receives a massive industrial project, it has also acquired new problems. It is already suffering problems of high prices for land, pollution, high migration segregation and prostitution according to report from the Municipal Secretariat for Social Security (SEDES) that deserves special attention by the authorities.

Considering some planning forecasts from the Municipality that over 150 thousands jobs would be created in Camaçari by the beginning of the 80's plus more than two dependents for each employee, we would have virtually half a million people living in that pole. Earlier estimates put the local population around 250 thousands by the same time. Jobs and population are supposed to be distributed in the following way:

<u>Jobs</u> - In the basic complex	16,000
- Derived from the down-stream industries	35,000
- Indirect jobs (calculated in the ratio direct/indirect equals 1/2)	<u>102,000</u>
	<u>153,000</u>



<u>Resident Population:</u> Camaçari (centre)	150,000
(Dias d'Avila)	<u>100,000</u>
	<u>250,000</u>

Dependent Population:

(Ratio employee/dependent equals 1/2)	300,000
(Ratio employee/dependent equals 1/3)	450,000

It is clear that the number of jobs does not match the growth of population, even assuming as correct the over optimistic forecast for the creation of 150 thousand jobs at Camaçari. With the service industry not concentrated at that town plus the slow build-up of the down-stream industries (see 1.5 and 2.4.5(a)) even a ratio of one direct job to two indirect jobs seem very high at Camaçari. That ratio would give around 36,000 indirect jobs based on the 19 thousand jobs in the firms now in operation in implementation or with approved projects (COPEC 1979).

Even if the estimates are too high strong pressure will be put on the government to house that expanding population, to provide services (health, education, leisure, transport and especially jobs). As far as the industries are concerned, they have to decide on the advantages and disadvantages of subsidising the transport costs of labour coming in from other towns. Alternatively, as long journeys to work negatively affect productivity and the corporate image of the industry at the local level they could back the programs of local services in the creation of a new community (housing, schools, services). Whatever the answer, the needs for an external corporate plan for the human resources are still prevailing. It has to be done regardless of the main authority behind it.

As the industries have a direct interest in the development of the human

resources at the NPP, they must also support any movement in that direction. From the present stage of development of Camaçari, the main features in this external corporate sub-plan must give priorities to such items as:

- (i) Health (Chemical industries can affect the health of employees and surrounding population.
- (ii) Schools - especially devoted to the children of NPP employees.
- (iii) Housing - priorities to those with jobs in the municipality or in any company of the pole, and avoidance of the creation of Shanti-suburbs).
- (iv) Infrastructure - Transport to work, communications.
- (v) Unskilled labour - There is a strong case to recommend the establishment of labour intensive industries around the pole without which the amount of unemployment might possible obstruct a suitable climate for the normal development of those capital-intensive industries. This is not a problem to be ignored even if the pole is incapable of providing sufficient jobs for that population. Future problems should be anticipated and action to avoid them taken today.

#### 4.6. CONCLUSION

The scheme chosen by the government to strengthen the Brazilian petrochemical industry and to leave the control of the NPP in Brazilian hands has neither proved to be an effective instrument of control, nor was it a reliable tool to make stronger the Brazilian private sector in petrochemicals, nor was it an efficient means to bring outside investment into the country. If the total private Brazilian participation in the NPP is small, the NE share of it is really insignificant. Furthermore, there is little participation of Engineering firms in the assembling and designing of the industrial plants. The initial advantages the government could have in exerting a stronger control

of the NPP, derived from its higher investment in the site and from the supply of feedstocks, shrink before the absence of a domestic know-how in the field.

The macro-structure of the different government levels, at Camaçari is not very appropriate to tackle the problems of large scale industrial investments for the following reasons:

- (i) lack of an effective coordination of many government organisations in the site;
- (ii) priority was given to the development of the physical rather than human infrastructure for the pole; hence
- (iii) priority was given to building a huge industrial complex rather than a pole in the Perrouxian sense.

The hopes put on the down-stream industries to further develop the social structure of the region with the provision of jobs are very weak due to the low rate of direct/indirect jobs in the few companies so far attracted to the NPP. As far as the organisation of the pole industries is concerned, it does not reflect a major concern for the development of the human resources inside or outside the companies.

There should be however, a fertile field for cooperation between the industries and the government for the social development of Camaçari.

CHAPTER 5 - THE HUMAN RESOURCE POLICIES

### Introduction

This chapter deals with the development of human resources policies in the NPP and studies their strategic importance for its consolidation. It is divided into four parts.

Part One deals with general issues of the HR policies such as its strategic importance, planning and demand and supply. Part Two, Three and Four are related to Entrepreneurs, Managerial Staff and the Professions, Technicians and Skilled Workers, the categories proposed in Chapter Four. The unskilled labour is dealt with in Chapter Six.

As the NPP was organised with several capital-intensive, profit-conscious industries, its commitment to create jobs has been conditioned by its labour-saving technology. The hope for substantial employment is, then, jeopardised, at least, at the core industries of the basic petrochemical complex. Further hopes to create more jobs lie, therefore, in the consolidation of the down-stream industries of the pole.

The chapter comments on the close relationship between the consolidation of the pole and its human resources policies, particularly for the entrepreneurs (part two), the Managerial Staff (part three) and the Professions, Technicians and Skilled Labour (part four).

PART I - GENERAL CHARACTERISTICS OF THE HUMAN RESOURCES  
POLICIES

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5.1. The Problem.

5.1.1. Strategic Importance of the Human Resources Policies.

5.2. The Place of Human Resources in Strategic Planning.

5.3. Demand of Human Resources at the NPP.

5.3.1. Petrochemical Profiles.

5.3.2. Characteristics of the Demand.

5.4. The Supply of Human Resources at the NPP.

## 5.1.

THE PROBLEM

The need for Human Resources management or development is increasingly accepted in the business world. Personnel Administration or management, socio-organisational development, industrial relations and socio-technical systems are all names given to the function of "developing and managing (a company's) human resources at work towards new goals of greater sharing of personnel, social and economic values". (Mills, 1973). Many other authors prefer a descriptive definition and enroll a list of some tasks that may fall under a human resources Unit. These tasks are: recruitment, hiring, training, developing, mobility, industrial relations, wages and job evaluation. Our main interests lie on those tasks which have a straight relationship with the impact an industrial company has on its environment, especially, recruitment, training, development and wages.

Regardless of whatever misgivings managers used to raise against any definition of human resources in an enterprise, we have opted for Mill's concept since it puts us straight into the business policy arena. Human resources are set towards goals, objectives. The first question, then, we have to ask is "who sets the corporate human resources plan in a company"? There is an increasing tendency to give the human resource field the same status that production, sales and finance have already achieved. In this way, it is believed that a human resource manager should be part of the top management of the company. Nevertheless this is still a controversial issue, since human resources policies can be regarded as a derived function in an enterprise, that is, the forecasted demand of labour, training and development, for instance, will depend on objectives set for other areas, notably, production, sales and finance (Reynolds, 1976). Following this line of argument, the human resources policies of the North East petrochemical pole is hinged upon the

provided. No  
simply be 'bought'  
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study indicates  
development level  
resources planning  
countries can be  
to be settled in  
borrow capital b  
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amount of goods to be produced and sold in the market. The shortcoming of this argument is that an enterprise must be seen as a system where the policies of each department are dependent on the overall objectives of the system. We are arguing that the business must be taken as a system, so that any function in an enterprise is dependent on all others and thus, is a derived one. As every single unit in an organisation depends on the people who work in it, it follows that the human resources policies involve all echelons of a particular company from the shopfloor to the top management. There are many reasons, however, why human resources planning deserves a strategic importance. It cannot be left to independent actions by different units, but has to be placed in a unit high enough in the hierarchy to give this field a unitary approach or to coordinate the policies adopted in any branch of the company.

#### 5.1.1. Strategic Importance of the HRP

Among the reasons of the strategic importance of the human resources policies, we can specify:

##### (a) Human resources are a scarce factor

As we can expect, labour with the many varied skills required in an industrial complex is difficult to find in an underdeveloped region. There is a surplus of unemployed people but this does not mean that a balanced labour force is available. That surplus is a liability rather than an asset in the short run. It really does not mean availability of an adequate labour force, so every enterprise must be prepared to convert that liability into an advantage. Even, if the petrochemical companies can find a glut of workers for some posts, there will be other occupations for which supply must be difficult to find.

##### (b) Human resources are not a barterable commodity

The installation of an industrial complex requires land, capital, machinery and men. In our case, the first three factors have been already

provided. Not only do the men take more time to find they cannot simply be 'bought in' in an underdeveloped economy. A company with the same machinery and using similar technology may have different productivity performance, in different countries. A UNIDO study indicates that this performance 'varies in accordance to the development level of the country. "It is, therefore, in the human resources planning that the key of modern management in underdeveloped countries can be found" (UNIDO 1966a). A company can buy an estate to be settled in, achieve the most up-to-date machinery available, borrow capital but it has to train and develop its labour force. That is of utmost importance for the strategic planning of the company. A very good approach is, to use Keller's words: (p.216) "to tap just about every possible source for additional entrepreneurs, managers and professionals". Harbison (1975 p.18) in a clearer and more daring way put human resources not only as the "active agents of production" but as "the central goal of development", and particularly, should we say, of continuing development, stage by stage.

(c) Wages and Salary

The increase in wages and salaries in the balance sheet has convinced many businessmen of the importance of manpower planning. Companies have to explain the reason why they are paying different wages to their employees, and for that purpose a structured scheme should be provided. In a highly competitive economy, the capability of firms to attract the best qualified labour force will hinge upon its wage systems and upon the image it has created in the labour market. In petrochemicals this argument has a serious shortcoming. Despite the fact that wages and salaries in the petrochemical industry are high in comparison with other industries (C. & Eng. Dec, 1977), this item represents only a small percentage of the product cost. So, petrochemical firms can increase substantially the wages of their labour-force without great alteration

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in the price of their products. Therefore, the management of petrochemical companies is not pressed by the wages structure in the same way as managers of such companies as textiles, clothing and footwear.

(d) Training and Development

The specialisation of functions has reinforced the needs of training and development for many posts, especially, those concerned with managing, supervision and production, where high technology is applied or where it changes. Sometimes, the retraining of the overall labour of a particular unit is necessary due to new industrial methods and processes. This takes time and money. Training and development has been regarded as one of the most difficult challenges in the North East petrochemical pole. Regardless of some experts being trained by the parent company, there are many posts for which there will be a shortage of suitable applicants. We must ask how to get the applicants for those posts or, how to give unskilled workers the necessary skills to carry out these specialised jobs.

(e) Changing environment and customers

It is not only the internal changes that exert influences on the policies of a company. Changing labour legislation, trade union militancy, public opinion, the corporate image of the company, the establishment of new enterprises in the same site which may compete for the company labour force, are all objects of concern. A manager of human resources should keep his eyes open for the inside and outside environment. Here, a problem of maintenance of its labour is essential. In competitive markets, firms do not want to lose key workers to other industries or companies since they may take technology away with them. An important point is that the close location of the majority of the North East petrochemical companies at walking distance one from another makes changing jobs very easy for employees.

(f) Integration and socio-technical system

The planning of human resources can only be effective if fully integrated into the whole planning system of the company. Thus, close links between the human resources planning department and production, finance, marketing, public relations, and whatever other department may exist in the enterprise should be accomplished. Some writers prefer the expression socio-technical systems, just to indicate that any change inside or outside the enterprise may influence the conduct of the human resources in the firm (Cornelissen, 1977).

The supply of labour for the company is closely connected to the overall corporate objectives of the firms and to the environmental trends. The demand depends specifically on the company's proposed objectives, and is also connected to the environment where it is set. Harbison (1975) came to realise that the concept of industrial relations systems illuminates the relationships among the actors in the industrialisation process - workers, management, government and society. The system's external environment has a role to play. This industrial relation system, which is part of the broad political and managerial system of each nation, lays down the fundamental points of the complex web of rules relating to each partner in the industrial relation exercise. Industrialists, government, shareholders, unions, technology and foreign partners, consumers market, all take part in the game. Governments, however, through legislation have increasingly become the most influential factor in any industrial relation system. Here, then, human resources policies are as heavily dependent on governmental actions as they are on internal plans.

(g) Crisis of employment

The regional development and the provision of jobs being two goals of the establishment of the NPP, the importance of HRP is straightforward. As the lack of jobs in general is a serious problem in the NE, the

underutilisation of the available labour force is an intolerable aspect of the NPP. The full and rational utilisation of manpower is not only a problem affecting the industrial sector, but also the whole community. As industrialisation and education tend to develop together, the NPP might be a cell of skills development in the region. The point here is not that the industries should turn into a university institution, but that the corporations, as every major social institution, have an educational role in society (Harbison 1975, Drucker, 1969). They have no option. We dare say that for better or worse industries have assumed this role throughout history. The strategic importance of human resources planning in the NPP is, then, twofold: it is a leading industrial project in the region and it has to assume an education role.

## 5.2. The Place of Human Resources in Strategic Planning

The place of human resources in strategic planning varies considerably from industry to industry. The organisation of its internal structure has to obey, of course, the size and type of industry, the management philosophy and local pressure. Large companies in highly competitive markets under the pressure of public opinion and well organised to meet these environmental constraints, are likely to have the better organised HR units. What should be clear is that HR policies cannot be left for decision by the HR Department alone; they must be an integral part of the total strategic planning exercise of top management: as with all strategies they must be constantly reviewed and up-dated. They cannot be taken without consideration of the external environment (the supply of suitable employees) as well as of present and expected future demands nor without the support of managers in every function and at every level.

Similar to other strategic issues, the policies on human resources should be the corporate work of a committee or a working party of directors who study the implications of the overall company's policies and state the human resource policies for implementation by the respective departments. This means that the HR Department is needed but it is there to operate within the strategy agreed from time to time. The level of such a Department inside the hierarchy indicates the importance management gives to the HR policies.

Moreover, human resources planning is a continuous affair often with a long lead time for adequate training and companies may not be able to cope with it unless they purposefully prepare their internal structure for that task. On no account, however, will the planning of human resources hinge only on internal factors but also on several others over which singular companies may or may not have control.

#### 5.2.1. External Factors

- (a) Population - Data on population, age mix, migration patterns, employment and unemployment levels, birth and death rates, distance travelled to work are all very important for planning and we have already analysed them in previous sections of this research.
- (b) Infrastructure - (housing, health, social facilities, leisure, transport, etc). This item is of paramount importance, in newly developed areas, since labour coming from outside may want to know details of these topics.
- (c) Education - The network system of education ' (universities, technical colleges, research institutes, etc.) must have an output adequate for the needs of the pole.
- (d) Global Performance of the Economy - The performance of the economy as a whole is clearly a thermometer for the health of any industrial planning. An economic crisis cannot only cause layoffs and shortage in



demand but also precipitate new waves of internal migration, which could put further pressure on the pole to provide employment through its down-stream initiatives.

(e) Training Facilities - What schemes, public or private, are there in the region for those who need additional training to carry out their jobs? Or else, what are the arrangements for the training of the new labour force? As the technical side, at Camacari, is overwhelmingly under the responsibility of the foreign partner, there are some contractual clauses by which he is responsible for the development, and training of manpower. It is very often regarded as part of the technological package but it does not relieve other partners from involvement in this important task.

(f) Other bonus for employment - It is a very common policy, nowadays, to give incentives to industries for the number of jobs they create in underdeveloped areas (Holanda 1975) Brazil does not follow this pattern. Employment, however, is seen as one out of several criteria for a firm to receive tax reductions to set up branches in the North East. (BNB. 1979)

(g) Arrival of new Firms - The development of new firms in the region will certainly contribute to a shortage of skilled labour due to the new specialised jobs that could be created.

(h) Building-up of the industrial complex - The construction and equipping of the pole provides jobs for thousands of workers who will be unemployed when the building-up period finishes. The authorities should have drawn additional plans so that the eventual layoffs should not create an atmosphere of disillusion towards the pole.

(i) Technical Change - Some technical innovations oblige enterprises to change their policies completely, with reorganisation of their labour force, requiring training, redundancies, transfers. This can happen in petrochemical industries by a change of the route of a given product.

(j) Global Statistics - There is a scarcity, imprecision and inadequacy of the statistical data available in Brazil and yet this is

vital for manpower forecasts in the short, medium and long terms.

This makes the exercise of planning even more difficult.

(k) Wages and Salaries in the Market - Some surveys have shown that wages are higher in the NPP than in other similar industries in Sao Paulo and Rio de Janeiro, and that, even before the development of the NPP, wages and salaries were higher in Bahia than in Rio de Janeiro (SME (1972)). Other researches have confirmed the same trends. (COFIC) However, as the cost of living in Salvador is also higher than in other major Brazilian cities (SEPLANTEC) the attraction of skilled employees from other regions has become even more difficult. There is a hope that these wages, would tend to equalise after a few years of operation of the new industries. It is thought to be just a matter of stabilisation of the total labour market. That is only possible, however, if there is a demand/supply balance in trained people for the jobs now seeking applicants.

(1) Institutions - Every country has its institutions to provide services in certain fields of industrial organisation. These institutions deal with such important issues as loans, subsidies, tax incentives and industrial location. As early as in the first stages of their projects the prospective enterprises need well trained managers able to speak the same language as the technocrats of those institutions and use their evaluation tools ranking from mathematical models to several criteria of social priorities. In this way, we can say that getting a project through the intricate web of bureaucratic agencies is the first test to measure the ability of managers.

### 5.3. Demand for Human Resources

The demand of human resources refers to the number of people the firms need today and will need in a future situation (Bryant & Niehaus, 1978).

### 5.3.1. Petrochemical Profiles

In the case of new industrialization programs, when many new firms come to the labour market approximately at the same time, planners used to make use of similar industries profiles to see the total impact of the forecasted demand of human resources on the market. Derived from the Master Plans for each industry, the Setrabes has arrived at the following profile:

<u>For the Basic Complex</u>	<u>Camacari</u>
<u>Category of Labour</u>	<u>%</u>
Executives	2,62
Technicians & Professionals	7,20
Operational Staff	53,15
Administrative Support	57,03
<u>For the transformation (downstream) industry</u>	
Executives	3,0
Technicians & Professionals	8,0
Administrative Support	5,0
Skilled workers	25,00
Unskilled workers	59,00

Present researches confirm these data. In effect, a study based on 1748 industries all over Brazil has arrived at the profile on the next page.

Because these profiles are for the chemical industry in general, the percentage for each groups has a wide variance. The percentages for the North East present desproportionate shares derived probably from the higher proportion of newly created petrochemical concerns on the overall chemical structure. According to the SME (1972) the basic complex was expected to have needed by 1979 some 8,000 technicians of a medium level, including:

Profile of the Human Resources employed by the Chemical Industry.

<u>Employee</u>	<u>North East</u> <u>%</u>	<u>Rest of Brazil</u> <u>%</u>
<u>1. Professionals</u>		
Chemical Engineers	1.3	2.8
Other Engineers	1.7	2.2
Chemists	0.7	0.5
Other	4.1	4.2
<u>2. Technicians</u>		
Chemists	2.1	2.9
Other Technicians	6.4	12.4
3. Skilled Labour	31.9	47.1
4. Unskilled Labour	51.8	27.9
TOTAL	100.0	100.0

Source: Percentages worked out from research by ABIQUIM "INDUSTRIA QUIMICA BRASILEIRA" (1979).

operators, supervisors, machanics, electricians and laboratory personnel, among others. As for higher level labour, the same estimate suggested that a total of 310 chemical, electrical and mechanical engineers would be required for the basic complex (COPEC 1974).

(a) Differences in Profiles

If we combine the equation and the profiles above, we will find that the percentage for technical and professionals seem to be very high in comparison with developed countries, where that share falls down to approximately 4%. - Canada, Japan, USA. In Latin America, however, it is generally very high (UN/ECLA - 1966). There are some hypothetical reasons for these differences, derived especificaly from the inefficiency of the educational system which does not produce a work force in balance with needs: There are too few craftsmen or tradesmen in contrast to a fair supply of the highly trained or educated categories.

Other reasons are:

- (i) The industries may be employing over-trained men for less skilled jobs;
- (ii) Industries may be employing university educated people who could not find proper jobs to do less skilled tasks, due to a shortage of medium-level skilled workers;
- (iii) The medium skilled workers are not sufficiently prepared to do certain kinds of work; then the industry make up with over-skilled labour;
- (iv) University educated professionals accepted less skilled jobs while waiting for promotion

Some industries have, however, a very low percentage of professionals in relation to the total workforce. An ECLA study found that in Peru skilled labour represented about 15% of the total labour in the chemical industry, compared with about 25% for metal manufacturing machinery.

A similar picture emerges from a companion ECLA study dealing with Argentina, where the chemical industry employs a smaller percentage (12 to 15%) of skilled labour than the seven other industrial sectors analysed ( UNIDO 1966a).

(b) Proportion of Professionals

The number of professional of course, depends upon the kind of engineering process developed, the level of automation, quality control, product characteristics and upon the precision and complexity of the required auxiliary services. The chemical industry, generally, has a high percentage of Technical and Professional manpower in comparison with other manufacturing sectors. (UNIDO 1966a).

The most important point here for our study is that the chemical industry, though employing very little labour, seems to save on management, which is another scarce factor in developing countries, if it is compared to other industries which use labour-intensive techniques for export-oriented products (Morawetz 1973). Seeing this problem in the NE a Brazilian planner in an interview has stated that to use labour intensive industries in that environment, they would need either a slavery structure or an organisation similar to the Roman Army, because the North East is completely without managerial staff at all levels, and labour intensive industries require a high proportion of supervisors, middle managers etc. Both the Army and slavery need staff for coercing people and maintaining production. On the other hand, capital intensive industries with highly technological plants give rise to a small labour force in general. However bigger the ratio of managers and supervisory staff to total personnel may be in those companies, this ratio does not compensate the actual loss of labour in lower ranges (Woodward, 1965).

Table No. 5.14

Forecast Demand of manpower in the basic complex

Category	Total in the period 1975/1980	1978	1979	1980
Executives	223	10	10	10
Technicians and Professional	542	31	31	31
Operational				
Support	4.984	236	236	236
Administrative				
Support	2.029	74	74	74

Source: SETRABES.

The figures on the last three columns represent the additional requirements needed per year as they were originally forecast.

The figures on the first column are the total demand for those categories in the period 1975/1980.

SENAI research using different methods has forecasted 26.000 and 27.500 employees in Brazil for 1981 (SENAI 1977). These figures are very pessimistic for the present development of the petrochemical industries in Brazil. The petrochemical complex at Camacari alone would have 50% of that figure (see chapter 5.2) which leads us to believe that the number would be much higher.

Table No. 5.2.

Jobs at Camacari and in the RMS including companies  
that are not on stream yet (Situation at Oct.1979).

Location	Firms in Operation	Firms under construction and approved projects	TOTAL	
			Firms	Jobs
Camacari	24	12	36	15,599
Simoes Filho and Candeias	6	1	7	3,565
TOTAL	30	13	43	19,164

Source: Secretaria da Industria e Comercio/BA.



Table No. 5.3      Profile of the workforce in petrochemical industries according to the research undertaken by SETRABES.

Occupations	Data from the Project ( % )
Skilled workers	41.8
Engineers (Total)	3.9
Chemists	2.4
Mechanics	0.5
Electricians	0.8
Production and Maintenance	71.9
Administration and others	28.1
TOTAL	100.0

Source: Setrabes - 1972.

Data were obtained from the projects of firms to be established in the NPP. Similar data were obtained in a research among 7 firms (6 petrochemical and 1 that could change to utilise petrochemical feedstocks) giving for skilled workers - 40.3%, Administration and others 29.0% and Production & Management 71.0%.

### 5.3.2. Characteristics of the demand of human resources in the NPP

#### (a) Lack of Experienced Labour

As the North East region has virtually no experience of large scale industrial petrochemical programmes, the figures referring to the gross availability of labour does not offer a clear explanation of the exact nature of demand/supply. An additional effort to specify each occupation content should be made. Let's suppose a demand of 50 maintenance technicians for the pole. The most important information, that is, 'maintenance technicians for petrochemical equipment', is missed from the figure. The importance of this detail is paramount, since we cannot study the demand/supply of labour without a clear specification of functions. In a way, most posts of the production area have specific requirements which the market is not able to provide. What the market can offer are candidates with a basic technical education who can probably quickly be turned into petrochemical maintenance experts. The training of someone with no technical background would be much longer and less certain. Following this line of argument, most candidates for vacant posts would require additional on-the-job training. The SENAI research (1977) has pointed out the most important posts in the industry with an additional indication of the training requirements. Unfortunately, the hard core data of that research was not published and an expensive national survey on the demand and supply of labour for the oil and petrochemical industries is kept filed in the SENAI and in Petrobras.

#### (b) Flaws in the Forecasted Studies

All the preceeding forecasts have some shortcomings. They were drawn from the original Master Plans of each industry, which were prepared to get the company's constitutional papers through the governmental Agencies for approval. Even if you think that those plans are strictly precise on the demand of

Table No. 5.4.

Distribution of Key Posts in the Oil and Petrochemical Industries

Key Posts	Total Oil & Petro- Chemical Industries	Petrochemical Operational Area
Engineers (Petrochemical Processing)	143	143
Equipment Engineers	1,101	156
Production Foremen	256	0
Petrochemical Processing Operators	3,777	2,017
Instrumental Control Operators (Material Output, Flows and Stock Control)	994	179
Analysts	893	279
Instrumentists	531	243
Mechanics	1,659	479
Electricians	787	253
Metal Workers	717	123
Welders	525	122
Maintenance Workers (Greaser)	181	65
TOTAL	11,564	4,059

Source: SENAI (1977).

labour, there is an element missing: the labour turn-over, which happens to be high in this type of industrial complex at underdeveloped sites. Furthermore, to produce a good forecasted demand requires experienced people working in the field inside each enterprise, especially when the operational areas responsible for roughly 70% of the total number of jobs are headed by managers with no regional expertise. Technical knowledge alone is not sufficient to forecast the demand of labour since the personnel requirements vary from country to country, region to region in accordance with cultural values, education, productivity levels, skills and so on. Any of these items can change considerably the output of labour at the plant (Farmer & Rich, 1965, Kindleberger 1970).

(c) Newly-built Industrial Complex

Another difficult problem is related to the priorities given to a green field industrial complex. Regardless of described objectives written down in common meetings and agreed upon as policies for companies in the pole, the whole effort of the organisations is directed just to put the company on-stream. Managers are aware that if any problem occurs in the production line that would endanger the functioning of the company and the whole planned scheme would come to a halt. The expectations in every corner is, then, to see the industry running on, diverting the attentions from other important points that can be put off for a while, whatever priority they may properly deserve.

#### 5,4      The Supply of Human Resources at Camaceri

##### 5.4.1.   Different Forecasts for the Supply of HR

To start with, let us look at the following tables 5/5 & 5/6 which reveal forecasted studies of the supply of Human Resources in the pole since 1972. We cannot expect the local labour market of an industrial complex built from scratch to be able to provide specialised employees requested by the industries. Furthermore, the public network system of education is not responsible for the detailed preparation for all the individual skills required in any business. The formal education system prepares the professional technical or craftsman with the required general tools and skills for a range of given jobs. The education system provides only the skills and the tools to carve-in the wood; the business gives further training on the peculiarities of the wood they have to use and of the furniture they want to produce. The SME made an analysis in 1972 of the previous output of professionals and technicians in Salvador and also forecasted the supply of labour to the pole. It predicted an insufficient supply of medium-skilled technicians, but pointed also to deficits in Chemists, Engineers and highly Skilled workers. (SME 1972).

The main flaw in the SME research was the assumption that 10%, 20% or 30% of the basic chemicals would be processed in the pole. Using those assumptions, they predicted that 9.000, 18.000 or 27.000 new jobs would be created. Those figures came very short of being realised and today the pole processes less than 5% of its output in Bahia, so the employment forecasts are quite wrong.

The SENAI research (1977), being undertaken much later, could provide a better analysis of the supply and demand of labour. It concluded there was no indication of relative or absolute scarcity of supply of the professionals for the oil and petrochemical industry in the period 1977-1981. That conclusion was drawn from the table No. 5.5.

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Table No.5.5

Demand/Supply of Professionals (Brazil) and Technicians  
(Brazil and North and North East) in the oil and  
Petrochemical Industry.

Employed	Global Supply (1976-1980)	Demand <sup>xx</sup> (1977-1981)
<u>Professionals</u>		<u>Brazil</u>
Electrical Engineers	2,578	166
Mechanical & Civil Engineers	7,934	48
Chemists	1,172	130
<u>Technicians</u>		<u>Brazil</u>
Chemists	5,332	129
Mechanics	5,065	144
Electricians and Electronics	5,451	1
		<u>North and North East</u>
Chemists	100	53
Mechanics	234	80
Electricians and Electronics	528	-

Source: SENAI (1977).

x About the concepts of Professionals and Technicians  
See 5.7.

xx Petrochemistry is supposed to have 1/10th of the Global demand.



Table No. 5.6.

Actual Sources of Skilfull labour working in the Oil and Petrochemical Industries in the NE. (Average of the period 1977-1981).

Posts	Regular Courses	Senai	Industries	Demand	Supply
Petrochemical Processing Operators	x	-	x	312	-
Instrumental Control Operators (Material Input, Safety and Pollution Controls)	-	-	x	40	-
Instrumental Control Operators (Material Output, Flows and Stocks Control).	-	-	x	34	-
Instrumentatists	-	x	x	61	-
Electricians	x	x	x	56	1,811
Mechanics	x	x	x	166	770
Metal Workers	-	x	x	40	-
Welders	x	x	x	31	1,181
Lathe Operators	x	x	-	6	693
Fitters	-	x	-	3	274

Source: SENAI (1977)

x regular source

- no source of that particular worker

E  
NG

Table No. 5.6.

Actual Sources of Skilfull labour working in  
Petrochemical Industries in the NE. (for  
period 1977-1981).

Posts	Regular Courses	Senai
Petrochemical Processing Operators	x	-
Instrumental Control Operators (Material Input, Safety and Pollution Controls)	-	-
Instrumental Control Operators (Material Output, Flows and Stocks Control).	-	-
Instrumentists	-	x
Electricians	x	x
Mechanics	x	x
Metal Workers	-	x
Welders	x	x
Lathe Operators	x	x
Fitters	-	x

Source: SENAI (1977)

x regular source

- no source of that particular work

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Fitters	-	x	-	3	274

Source: SENAI (1977)

x regular source

- no source of that particular worker

Those professionals were expected to be the scarcest in the NPP. Indeed, previous studies have over stressed this point, with sufficient ground for worry. Employees at this level are responsible for the maintenance and operation of very expensive equipment, on whose correct functioning the entire complex will depend. The situation is very similar for the supply of technicians - people with secondary education. Data especially for the North and North East give further support to that claim (Table 5.5)

Contrary to the SME research, which forecast a deficit of up to 50% in the supply of medium-skilled technicians, the SENAI study was more convincing in its arguments that there would be no absolute scarcity in the supply of this labour in Brazil as a whole, but, only some shortfall in their supply for the NPP. They have, however, rightly insisted on proposing different categories of these employees indicating some posts for which complete instruction would not be given in the schools but who would require extra courses that should be developed by the employers. We will come back to this point when studying this category in more detail further on in this chapter.

The most inaccurate point, however, in the original forecasts was made for the semi-skilled labourers. The SME study was cautious, indicating an impossibility to forecast the demand/supply of this class of workers. They pointed out, however, that the education system was able to attend to the prospective demand of the pole, implying, therefore, that no shortage should be expected. But the SENAI research detected several types of jobs for which there were no candidates being prepared by the education system. The industries then would have to assume that education and training role with significant effort. Table 5.6 shows that the supply of some strategic jobs in the NPP could be a problem.

#### 5.4.2. Some Characteristics of the supply of human resources to the NPP.

There are some characteristics of the petrochemical pole at Camacari which might well exert influences in the supply of labour.

##### (a) Newly built Industrial Site

First of all, we must bear in mind that Camacari is a newly-built industrial site and, therefore, any suitable scheme for on-the-job training cannot be fully accomplished. Firms which have other branches in Brazil, notably in the South region, may well send suitable trainees to their factories in Sao Paulo or Rio de Janeiro to learn their skills in established undertakings. This is possible because the number is small. Other foreign partners have no alternative than send some technicians abroad to similar plants where they can undertake an effective training in the parent company. Due to the costs of air tickets, accommodation and the like, this can be done only with a small proportion of the labour force, ideally well educated so that they can form a cadre to set up skill-training at home. Furthermore, costs of training are inserted in a clause for technology transfer or technical assistance which means that the country will pay for it. The whole problem seems to be reduced to the famous vicious circle of developing countries: not sufficiently trained labour force and lack of financial resources and technical means to train it. The main question, then, is if the training provided by foreign companies under the programme of technical assistance is the best way to tackle this problem.

##### (b) Costs of Training.

If the cost of training is already very difficult to assess at any single firm, it is much more difficult in a complex such as the NPP, where many Institutions operating in the education and training of each category of labour (list on the next page) have divergent methods of accounting.

Table No. 5.7

Institutions devoted to training of different levels  
of employees in the RMS.

Category	Institutions
Managerial Staff	Universities CEPED/CENDRO Federal Ministries COPENE PETROBRAS/CENPEQ Universities/Schools
Technicians	Centec Technical Colleges Petrobras
Skilled & Semi-skilled Labour	Petrobras On-the-job training programs Technical Schools Senai Pipmo/other Institutions

Source: Direct Research.

A research undertaken by COPENE has arrived at the figure of \$US 9,000,000 as the total training costs for all the programs in the NPP.

That figure would give us:

Total investment	- \$US	3,500,000,000.00	≈	0,26%
Training costs	- \$US	9,000,000.00		

Training costs are 0,26% of the total investment. That figure is ridiculous, since it included only direct costs involved with wages and salaries. Even if we put the indirect costs in a ratio of 1/2 the percentage would not be much higher. It goes contrary to the general belief that industrialisation in underdeveloped areas has to spend much money on training of labour. (Myrdal, 1957; Hirshman, 1958; Friedman, 1966).

#### (c) Collaboration and Competition

Collaboration and competition between firms may speed up the process of human resource planning. Competition may compel firms to take steps not to lose key labour for their competitors. Collaboration leads companies to adopt similar approaches in many fields such as recruitment, training, wages, transport subsidies etc. A key factor in all these agreements is the physical location of the pole - companies are clustered together outside the town - which make the site a fertile field for both cooperation and distrust. In fact, there have been some agreements in the NPP regarding the sharing of training costs, on pay policies and on recruitment. Firms had to reach a compromise on not persuading employees to change sides or there would have been an unbearable struggle for skilled labour in the market, regardless of whether they are working next door or not. Of course, it is very difficult to get firms to stick to these agreements until there is at least a demand/supply balance in the area. These arguments, however, should not be made at the expense of the labour force and used as an excuse not to raise pay levels when they are needed in the absence of competition or even

to compel employees to remain in a single firm, by limiting the possibilities for them to get a job elsewhere in the pole, which goes against a sound practice of fair human relations policies. It is a restriction of common freedom to forbid labour to change firms and not allow each employee to choose what he sees as the most suitable jobs for him.

#### 5.4.3. Conclusion and Recommended Strategy

Taking that the human resource policies are of strategic importance for the NPP (5.1.1.) we have to study what strategic decisions the pole should adopt to overcome its main weaknesses in the human resource field. This is better explained if split into parts corresponding to specific categories of labour (see chapter four). As we have already mentioned in the general introduction to this chapter, we have also given a special attention to entrepreneurs since they were expected to have further opportunities for their activities with the establishment of the pole, since entrepreneurship is one of the major objectives of the pole as expressed in the adoption of the "tripartite" formula. There are some general issues that could well be applied for the overall human resources in the pole. Here specific policies should be taken in order -

- (i) to have a better understanding and if possible some control over the external factors affecting the performance of planning (5.2.1.)
- (ii) to improve the internal organisation of the companies in the field of human resource policies,
- (iii) to increase cooperation among the enterprises of the pole,
- (iv) to reinforce corporate agreements among all the technical colleges, schools, universities and institutes of training to improve the quality of supply,
- (v) to provide training for those jobs where supply in Brazil not only in the NPP, is short of the demand, e.g. skilled workers,



- (vi) to obtain agreements among the firms in the area which may need the same kind of workers; to standardise training, agree on numbers to be trained to what level and reduce poaching of skilled people by one firm from another.
- (vii) to set up and support an R & D Institute capable of absorbing and creating advanced technology essential to the pole.

PART II:      THE ENTREPRENEURS

5.5.      THE ENTREPRENEURS

5.5.1.    Introductory concepts

5.5.2.    Schumpeter

5.5.3.    Managerial Approach.

5.5.4.    Behavioural Approach

5.5.5.    Recent Trends in the study of Entrepreneurship

5.5.6.    ENTREPRENEURSHIP IN THE NPP

5.5.6.a   ENTREPRENEURSHIP for the Transformation Industry

5.5.7.    CONCLUSION.

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## 5.5. Entrepreneurs

Entrepreneurship is at the root of any industrial development. Economists seem to be agreed upon the important role entrepreneurs have in the economic development of any region. Staley and Morse (1965) reviewed and stressed the significance of small entrepreneurs in developing countries. Bauer and Yamey (1957) related the progress of a society to the degree of entrepreneurship it has. Max Weber (1977) saw the entrepreneur as a key actor in the performance of economic development, while Kilby, (1971) sees entrepreneurs playing a key role as adaptors of modern technology. While writers seem to have been agreed upon the importance of entrepreneurs in industrial and economic development, there is a great controversy on the exact nature of their role.

### 5.5.1. Introductory concepts.

The word was introduced by Cantillon, R (1756) from the French verb "entreprendre" (to promote). The etymology gives an initial functional emphasis to the concept. It also means to take in hand. So the entrepreneur is the one who takes in hand the elements of enterprise, that is any undertaking. For a brief example, Watson, (1972)

"the firm is personified in the entrepreneur, who exercises ultimate and decisive control over the activities of the firm: The entrepreneur brings the firm into existence and takes it out" (pp.40).

In this sense there is no entrepreneurship in the NPP, since it cannot be "personified" in a single person. Should this concept be expanded to include groups of entrepreneurs, organisations, government branches, instead of a unique creature, it would have made more sense in our case. So, the first problem lies in the exact concept of "entrepreneur" one may assume. In my opinion, there is a tendency to over-stress his role in organisations. The entrepreneur, sometimes, seems to be a mythological figure such as Hercules opening the Gibraltar columns to separate Africa from Europe. Perhaps this is a consequence

of our culture which has overemphasised the individual role in society. As our economy is becoming more complex, and organisations have occupied virtually all places of human innovation, the role of entrepreneur is obviously reduced. His role is similar to that of the inventor. Both were very important at the beginning of the industrial revolution. As invention today is coming out from organised laboratories, rather than from individual efforts, the inventors as such have almost disappeared; similarly the entrepreneur as individuals are becoming scarcer. Invention today comes mainly from professional teams working together for established organisations. Even important individual contributions to the invention process are inside or with the collaboration of a bigger group. Our environment with so many government regulations, social ethics for business, market restrictions, communications, make the rise of entrepreneurs very difficult. And much more difficult when the instrument the government use to foster entrepreneurship is an industrial pole whose units have no grass roots at the region. The innovation process need not be about a product but also about such things as marketing, distribution chains, raw materials or the link between these or other undertakings of an enterprise. Maybe the use of alcohol in place of petroleum, for instance, could be a fertile soil for entrepreneurship. Another concept of entrepreneurs, very similar to this mythological personality, is related to the classic theory of the economic man. Ket de Vries (1977) stated, however, that the entrepreneur 'bears no resemblance to that mythical creature of economic theory, the economic man'.

#### 5.5.2. Schumpeter's entrepreneurs

Entrepreneurs says Schumpeter (1939) are :

- Individuals who carry out innovations;
- Individuals who may but need not be inventor of the process they introduce;
- come from all classes and therefore do not form a social class;

- Are leaders but need not be owners of the capital.

In a later paper, he introduces some complementary notes to that concept. First, he relates it to the environment in the sense that "every social environment has its own way of filling the entrepreneurial functions". Second, the entrepreneurial function need not be embodied in a physical person and, in particular, in a single physical person" (Schumpeter 1951). As an example, he quotes the entrepreneurial function of the Department of Agriculture which had performed successfully its task of teaching new agricultural methods in the U.S.A.

This complementary contribution, which is essential for the understanding of his thoughts can lead us to assess the entrepreneurial function of the NPP from another angle. The assumption is that the NPP can foster entrepreneurship in the North East if it manages, as an organisation, to make an effective impact in the regional industrial structure or if it can perform a role of a teaching organisation similar to the Department of Agriculture in Schumpeter's example.

The effect of this entrepreneurship, however, could be measured only after the pole consolidates its structure and that takes time.

Moreover, we need to be careful not to claim that the pole is giving rise to entrepreneurship in the North East, unless we can see real entrepreneurs coming out of the region as a consequence of the social impact of the industrial complex. This does not mean that there is not an inherent entrepreneurial role in the NPP. A role may or may not be performed even when it exists. Time will tell whether the regional organisation has succeeded in the role or not. It seems to us that a wider concept is required to explain "entrepreneurship" in our society. Of course, there is not much point in arguing about the advantages or disadvantages of the "entrepreneurs" as they existed at the time of the first industrial revolution, since our present environment has changed their nature (Farmer & Richman 1965).

A broad concept of entrepreneurship includes as entrepreneurs not only those starting new business but also technocratic employees who become inventive and innovative agents inside their own organisations (Harbison & Myer, 1959). It is unfair to say that Rockefeller, for instance, was the only entrepreneur in the Standard Oil. All those men who have brought the Standard Oil into Exxon Empire were entrepreneurs as well. In addition an entrepreneurial function is the foundation of many successful government companies throughout the world.

As the idea in the NPP is to get a mixed economy running smoothly, we have to admit that any of the parts can have an entrepreneurial function. The point is very straightforward. When there is an entirely private sector economy, the entrepreneurs are theoretically individuals or private companies. But, when the government has a great stake of the economy, it should also act as an entrepreneur. Admitting that foreign partners and the government are getting along well in this particular function, we should look for the third partner in that pole: the private entrepreneur. Who are they and where do they come from? As there is a specific purpose to develop the human resources of the region we admit that a failure in not having regional or local entrepreneurs would unmistakably be a serious blow for the whole planning process.

#### 5.5.3. The Managerial Approach

Schumpeter has also given room for another interpretation of entrepreneurship, that we may call the managerial approach. That means what some writers identify as the fourth dynamic element in any economy: the big "four" instead of the traditional big three - land, capital, labour and entrepreneur. (Myrdal 1957, Montjoy 1963). This theory implies that, without entrepreneurship all the other elements capital, land and labour - would remain in a latent rather than in an effective stage.

The complex nature of our society has, again, put some constraints on that argument. As entrepreneurship now is occurring in an organised way, we can identify it as combination of labour and capital in some cases. Entrepreneurs were also very often related to some products or services. Those who picked up products and services with bright future had achieved more success - Rockefeller, Ford, Hilton etc. A growing market was always at the root of successful entrepreneurship. Many times, however, the entrepreneurs based their success on comparative advantages which put them ahead of their competitors. Those advantages would be derived from technology, new invention, reduced labour costs, massive production, very often new production methods, to say nothing of discovering new applications and markets for well known products.

There is also another important element. Many entrepreneurs have been pioneers on their own businesses. That takes great risks, but also is a clear advantage when the business is successful. Those who simply copy somebody else's patents, models etc. can be caught in a trap - long or even everlasting dependence. A counter-argument that might be well used here is the development and growth of industries in countries such as Japan, Korea and Italy, that use products and technologies developed elsewhere. I do not think that this argument can be used in favour of entrepreneurs in the North East, for many reasons. Petrochemicals require so much capital and skills that inhibit any serious domestic challenge to the foreign companies which establish factories in the pole. Furthermore, the technical (technological) management of the firms at Camacari are under the leadership of the foreign partner. So, it is very difficult for us to recognise domestic entrepreneurship where no sign of local innovative and independent steps are taken. When there is no great economic advantage, such as those derived from inventions, technology, cheap raw material or cheap labour, the entrepreneurs have often opted for safe products and services, they know well beforehand.

In the case of the North East, it is very difficult to foresee how the petrochemicals can attract or give rise to local entrepreneurs, even if many incentives are offered to attract them. Why should prospective entrepreneurs put money into petrochemicals, when they do not feel in the lead nor have significant advantage in terms of technological skills, labour costs or even return on capital investment? Moreover, petrochemicals are not their traditional business. So they continue to put their money in other fields, even in the property market, that could have returns much higher than petrochemical activities.

It is also a bit odd to identify the holding groups, banks and investment agencies as local entrepreneurs. Of course, we have to admit that one of the recent development of business is to have entrepreneurial management rather than rely only on the spontaneous appearance of this 'rare species' called entrepreneurs. Admitting these hypotheses, the individual entrepreneur of the region will not benefit at all from the establishment of the pole. Either, the entrepreneurs are the large companies based outside the region, or they are from within a few large group already operating locally. On any hypothesis, entrepreneurs will not be born at the site.

#### 5.5.4. The Behavioural Approach

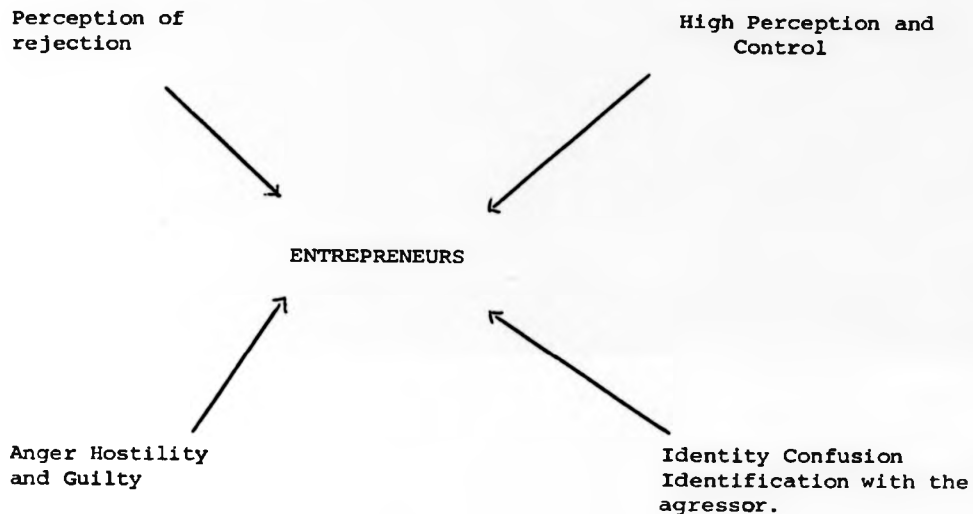
Social scientists have tried to specify some qualities an entrepreneur must have. Prominent personalities in this study are McClelland (1961, 1975), Collins and More (1964) Ket de Vries (1977), Dayley (1971). In spite of many disagreements about the origins, motivation and personality of the entrepreneurs, some factors are generally recognised important for the entrepreneurial function. These qualities are described as a high need for achievement (or power), a strong motivation to success, a desire for autonomy, an above-average risk-taking propensity and an urge for leadership. (McClelland 1961) Others see entrepreneurs as people under stress, who very often come from minority groups that



might have special motives to go on their own way, fighting for survival against heavy odds. Immigrants, minority and racial groups are among leading entrepreneurs. This leads to the assumption that social background may have an influence in the entrepreneurial personality. But to some it appears that the entrepreneurs really emerge when there is an environmental turbulence (the reactive model). Ket de Vries (1977) makes an attempt to describe the entrepreneurial function according to this last model (see the next page). In Brazil, this behavioural theory has a wide acceptance. Indeed, the appearance of the southern entrepreneurs is closely related to immigration and minority groups. The appearance of many European immigrants had such an impact on Brazilian management that in several interviews I had with prominent personalities at Camacari that factor was always mentioned. It is not unusual to hear that the lack of entrepreneurs in the North East is a consequence of the region not receiving these migrants, and that the appearance of regional entrepreneurs might be dependent on another environment turbulence in Europe, USA or Japan, which would provoke new waves of immigration to Brazil. Of course, this is an extremist, rather churlish, approach. It does not seem that migration is the cradle of the thousands of entrepreneurs that have appeared in countries such as Japan, UK, France, Germany, etc. Some are obviously indigenous

It seems that the history of industrialisation does not fully support the behaviourist approach. In fact it is not sufficient to explain the first industrial revolution in the UK, though in some areas of enterprise for instance, banking, migrant jews were the source of Western Europe entrepreneurship. However, the European entrepreneurs generally were not men belonging to minority groups, neither was the industrial revolution the consequence of an environment turbulence. Also, in Bahia, research carried out by Brandao (1974) studied the origins of local entrepreneurs and executives in great depth. The results do not lend any support to the behaviourist theory. Notwithstanding, a certain degree of migrant influence was clear in the Brandao studies. Many entrepreneurs

Psychodynamic forces influencing the entrepreneurial function.



The 'reactive' model (guilt-ridden, rebellious, impulsive, deviant in their behaviour with inter-personal problems, non-acceptance of the existing structures, in difficulty with authority, denial, projection reaction formation as defences. (de Vries, 1977).

had foreign ancestors (parents, grand-parents or great-grand-parents). Even those who were a remotely relative of European immigrants, praise themselves as being of European descent. There were cases both parents and grand-parents were genuinely Brazilians, but with a great-grand parent (father or mother) being European. The executive or the entrepreneur considered himself, in that case, as descending from European families. Brandao called that a case of "cultural alienation" that is, even genuine Brazilians prefer insisting upon their immigrant origins to being taken as a traditional Brazilian family. Facts such as those described by Brandao have contributed to a tendency to ignore a great number of entrepreneurs who were born in the region, but prefer to deny it for social status. They also help those who believe that entrepreneurs in Brazil are necessarily related to European or other immigration.

We do not follow this line. Any society has its own entrepreneurs, depending, of course, on the resources on which the entrepreneur can operate, and on the way the economy is organised. Bahia had a successful entrepreneurial business community, before the beginning of this century. Why cannot it have them now? If there is an answer, it seems to lie in the way the environment is organised and not in cultural values or otherwise. Each culture or each country can have its own entrepreneurs. (Schumpeter, 1951).

#### 5.5. . Recent Trends in the Study of Entrepreneurship.

Based on the previous concepts, especially on the behavioural and managerial approach, there has been an emphasis on the training aspects for entrepreneurship. University Business Schools and writers have been recently developing studies on entrepreneurship. De Vries (1977), Eggens (1977), Kierulf (1975), McClelland (1961), Timmons (1975), Collins and Moore (1964), have commented on recent trends.

Burke (1968) in a specific study of the NE of Brazil reached the conclusion there were potential entrepreneurs capable of being trained to start businesses on their own, while Buchele (1972) has found sufficient evidence throughout worldwide experiences that entrepreneurship can be developed:

"Entrepreneurs can be produced and those new entrepreneurs start new businesses that can survive. It is possible, also, to stimulate existing entrepreneurs to greater efforts, more rapid growth of their businesses" (p.63)

This widely accepted trend in entrepreneurship studies seems not to have made a strong impact in Brazil and specially in the planning of the NPP. In fact, there are no reported efforts aimed at promoting the development of new entrepreneurs in the NPP, or elsewhere in Brazil.

#### 5.5.6. Entrepreneurship in the NPP

An analysis into the composition of shareholders and leadership of the enterprises of the pole, indicates the extent to which regional entrepreneurs were attracted by petrochemical industries. See Table No. 5.8.

It seems that government plans, when referring to entrepreneurs - "empresarios" - really mean capitalists or people with sufficient economic resources, what differs significantly from all the previous concepts we have discussed.

From table No. 5.8, we can easily conclude that the participation of local entrepreneurs in the pole is insignificant. Furthermore, the participation of two bank groups really reinforces the claim that the absence of regional entrepreneurs is largely due to the economic nature of the business which is highly capital intensive. There is, however, a strong possibility of the appearance of entrepreneurs in the service and engineering industries in the pole. The most important companies in this group are those related to the Engineering Process and Assembly Production. Despite this possibility Table No. 4.4 does not

Table No. 5.8

Firms which have regional shareholders in the NPP.

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<u>Firm</u>	<u>Shareholder</u>	<u>%</u>	<u>Nature</u>
CETREL	State of Bahia	40	Government
	CEPED	30	"
METANOR	Desenbanco	0.331	"
PRONOR	[ Petroquimica da Bahia	33.3	Private
	] Banco da Bahia		
C.Q.R.	Henrique Lage	6.64	Private
DETEN	Luciplan	15.0	Private
POLIALDEN	Banco Economico	33.3	Private
POLITENO	Nordesquimica	13.3	"

Source: COPEC Situacao das Empresas

show many local enterprises in this sector; regardless of any sound reason that may be presented, local entrepreneurship is, then, restricted to minor services such as the provision of meals and transport.

We may conclude, therefore, that the basic complex and its upstream companies have made no contribution to the emergence of local entrepreneurs. So, up to this point the NPP did not attract the local community as far as entrepreneurship is concerned.

#### 5.5.6. (a) Entrepreneurs for the Transformation Industry.

Any hope of entrepreneurship, therefore, is placed on the downstream industries. The initial forecasts were to turn a minimum of 10% of the petrochemical production into feedstocks for other end-consumer goods. The present situation is that less than 5% of the pole output is actually processed by downstream industries. This factor by itself reduces greatly the availability of opportunities for eventual entrepreneurs. If we take the average forecast of twenty per cent, the result would be even more striking. There are a lot of alleged economic reasons why new firms do not want to establish factories in the NE now. The main ones being the idle capacity of some sectors of the down-stream petrochemical industries already settled in the South despite that region having its own consumer market. In fact, the prospects for a sudden increase of firms in the pole is really very gloomy since the plastic industries and other downstream industries are already running at idle capacity in the South East. Those industries are firmly established in that region, where, in Sao Paulo alone, they have more than three thousand factories employing over 100.000 people. Public authorities, however, have recognised this problem and created other Units to tackle it. Propar, for instance, is a public company established specifically to foster the establishment of industrial companies at Bahia. It is worth realising that Propar as far as its constitutional documents say, was

## Proposed Industrial Units for the N E (Plastics)

PRODUCT	Technology	Investment US\$ M
PVC wiring and cables	High	30.0
Polyethylene Bags	Low	3.6
Plastics Medical Articles	Medium	6.6
Flexible laminates of PVC	Low	31.3
PVC sheeting and flooring	Low	4.9
HD—Polyethylene Furniture	Low	0.6
Domestic items for Polyethylene	Medium	1.5
Polyethylene & Polypropylene tubes & connections	Medium	0.5
Sheet and film made of PVC for packaging	Low	5.0
Agglomerated tanks & laminates of polyester	High	8.9
Grinding wheels, emery clothes, abrasives, brake linings & clutch discs	High	1.0
Phenolic & melamine laminates	Low	2.0
Flexible foams	High	2.5

not directly related to the pole; the circumstances under which it was created, however, indicate that the pole is the reason behind it. The establishment of Propar in 1975 was very late in comparison with other institutions at the pole, (see section 4.4.2), which indicates by itself that getting local business participation may not have been the main concern of the authorities when the pole was set up. Furthermore, Propar goes on pursuing very weak policies in its attempt to foster entrepreneurship. It has gone along with previous policies adopted at Camacari and that envisaged the attraction of Southern enterprises, instead of the creation of new local ones. Of course, Propar as a public company of the State of Bahia is restricted to its role of fostering industrialisation in Bahia and not in the whole North East region. A good way to verify the opportunities of entrepreneurship in the NPP is to look for those products that can advantageously be produced in the region, without jeopardising the industry of the South. We assume that there is no point in planning the opening of an industry for the closure of a similar one elsewhere. There have been some studies on these topics and they suggested the units on tables numbers 5.9 and 5.10 for the whole North East. In principle, only some of these industries will be established at Camacari, since the designation of all industries for only one site would raise strong political opposition, especially where there are other economically alternative locations. Furthermore, these industries are market oriented and need to be located near their respective markets, not only in Salvador. But even assuming that all these units were set up in Bahia, the restrictions on entrepreneurship will lie in its technical side and on the amount of investment required. Entrepreneurs tend to go into markets and products they usually know well, or alternatively into those sectors where they can find significant advantages. As the raw materials in Bahia are sold at the same prices as their counterparts in the South, it does not seem that there are many clear advantages left.



Table No. 5.10.

Proposed Industrial Units for the NE, (Middle/low technology)  
(Elastomers)

<u>Elastomers Industries</u>	<u>Investment (1977) US\$m</u>
1. Rubber Goods for Industrial and naval Utility	74
2. Rubber goods for housing and building	78
3. Rubber Goods for the motor vehicles	63
4. Rubber goods for personal usage by workers in the production line areas	59
5. Rubber hoses, belts etc	114
6. Rubber glues	38

Source: CLAN/SUDENE

US\$ 1.00 = CR\$ 16.00 in 1977

There is a point, however, which seems to favour a petrochemical complex. Its range of products and subproducts is extremely high. Many of those products needing only simple changes to turn them into new consumer goods, e.g. packaging, others, such as paints and varnishes require quite a difficult production process. The point, then, is to find out which products can be produced in the region and which require relatively simple technology and do not need high investment for its plants. (Table No. 5.9). The range of products, low technology and investment have made the plastic industry so fragmented that one may believe in the impossibility of planning for it. It is difficult even to say precisely how many industries in this sector we do have in Brazil, since some units may be classified as backyard and handicraft type units.

A study by Sudene (1977) suggested that planning for those small companies would be a useless task and that it should not deserve any degree of priority. This points out that the development of entrepreneurs had not been considered when such a recommendation was made. If there is a sector rich of opportunities for eventual entrepreneurs it is in the small scale industries that can be developed in the North East. Of course, entrepreneurship cannot be planned in strictly mathematical or quantitative approaches, which goes against the concept of entrepreneur, but it is possible to work on providing such conditions that the appearance of entrepreneurs for those small units is more likely.

#### 5.5.7. Conclusion and Recommendations

Whatever concept of entrepreneur we adopt, there has been little done in the NPP for his appearance training and growth. Taken in its traditional sense, (Watson 1972), the room for entrepreneurship in the NPP is small. In the later Schumpeterian sense, we may reserve a special role for the NPP itself as an Institution capable of teaching entrepreneurship, though does not mean that it has fulfilled its capability. The success and

adaptation of the pole can also prove to be an entrepreneurial activity, according to Harbison (1959).

The NPP, however, has found great difficulties in attracting new entrepreneurs due to the nature of its business (strange to the region) and to the amount of skills and knowledge it requires. In fact, the analysis made of the composition of shareholders and leadership of the enterprises of the pole shows that local entrepreneurs are not involved at all. Even the presence of some regional capitalist groups inside the pole (Banks, for instance) does not prove the raising of regional entrepreneurship, by the simple fact there is a difference between that concept and the notion of ownership. Not only at the basic complex but also in its upstream peripherals (assembly engineering plants, maintenance service and so on) the presence of Local entrepreneurs is at a minimum level.

More hope for entrepreneurship lies in the development of downstream industries. This, however, has been facing some structural difficulties due, especially, to the small percentage of the petrochemical feedstock processed in the NE, the remainder being exported elsewhere in Brazil or abroad, to a lack of specific know-how, to the already firm establishment of those industries in the South East, to the small size of the regional market and to the absence of policies aiming at fostering entrepreneurship in the region.

Instead of being entirely devoted to the planning of a 'small number of companies of reasonable size', operating units involving huge investments, producing manufactures with a considerable degree of added value, all the agencies responsible for fostering the industrialisation of the North East should pursue policies aiming at the creation of suitable conditions for the appearance of entrepreneurs.

The role of the pole is to create the right atmosphere for entrepreneurs to begin operating. It is not a question of infrastructure only. Policies intended to provide suitable labour, to encourage regional

investments, to back small scale petrochemical using firms should also be present. A survey made among small enterprises at Salvador has shown the local entrepreneurs were never consulted or even taken into account in the implementation of the North East petrochemical pole. Bearing in mind the new role of entrepreneurship performed by the pole, as we have stated before, it should have a catalyst function to encourage small entrepreneurs. This encouragement requires steps in the following line:

- financial credit - unfortunately the incentives the Federal and State Government give to these small businesses are much smaller than those provided for the basic complex. New financial encouragement, not only in terms of tax reduction or tax holidays or low cost factories, but also in guiding and assisting new potential entrepreneurs in financial management and in the raising of capital, must be made available.
- Market orientation - the real advantage of a complex lies in the existence of markets where it can place its products. A careful study of market trends should always be a guide for future entrepreneurs.
- Technical cooperation - A centre for teaching labour skills required for new units and for the transfer of simple technology is indispensable. Financial resources applied in this sector are well deserved.
- Special incentives for those firms already set up in the area - an eloquent indication of the low priority small firms receive in Brazilian regional planning was the lack of communication between Public Authorities and the small firms during the initial stages of the implementation of the basic petrochemical complex at Camacari. In effect, an up-to-date survey of those firms has only recently been made.

At last, we conclude that, as far as entrepreneurs are concerned, the North East petrochemical pole has not made a significant impact on the traditional local entrepreneurs up to present time. It is a bit churlish to say that the North East Petrochemical Pole does not offer entrepreneurial opportunities due to its capital-intensive nature. We

may believe on the contrary that more and more entrepreneurial functions may arise from a large and integrated system such as the NPP. The problem is only how to develop a mentality of entrepreneurship and provide conditions for the appearance of those who may turn business opportunities into reality.

What we can say is that the petrochemical complex has not yet provided structural conditions for the arrival of small entrepreneurs. We may expect that the pole, as a leading industrial complex, has effective conditions for performing by itself the function of entrepreneurship in the latest Schumpeterian concept, that is, the role of fostering entrepreneurs. To do that it needs to give a high priority to small units that can be set downstream of its basic complex. This, however, has not been the case.

THE MANAGERIAL STAFF

Part III

5.6. Managerial Staff

5.6.1. Concepts.

5.6.2. Management Development.

5.6.3. Management Courses.

(a) Knowledge

(b) Skills

(c) Behaviour

5.6.4. Management Development Practice in the NPP

(a) Costs

(b) Technology Transfer to Local Managers.

5.6.5. Strategies

(a) Short term

(b) Medium term

(c) Long term

5.6.6. Conclusion

### 5.6.1. Concepts

The term 'management' is well enough known and does not require a major elaboration here. We have just to state that we are dealing with the managers from the middle to the top of the hierarchy of a company. We are very close to Drucker's (1969) concept of 'Executive':

"I have called 'executives' those workers, managers, or individual professionals, who are expected, by virtue of their position or knowledge, to make decisions in the normal course of their work that have significant impact on the performance and results of the whole.... Every knowledge worker in modern organisation is an executive if, by virtue of this position or knowledge, he is responsible for a contribution that materially affects the capacity of the organisation".

Mintzberg (1973) has a broader concept by which 'the manager is that person in charge of a formal organisation or one of its subunits.' Although he found that "managers jobs are remarkably alike" (Mintzberg 1973) he also pointed out important differences derived from the job itself - the level in the hierarchy and the function supervised and stated that 'there is a considerable evidence of role specialisation by function' that 'moving down the hierarchy, the jobs become more structured', and that 'the top managers job is more concerned with strategy-making of a broad nature. At lower levels the work is more focused, more short-term in outlook'. The literature backing this point is very extensive, but as we are dealing with business policy and strategic decisions these differences are sufficient to justify our dealing with the middle and top managers only.

The problem is that the philosophy behind foremen and other low ranked managers involved in operations is completely different from those dealing specially with the decision-making process. In this sense, it would be wrong to put together top managers, divisional managers, supervisors, and foremen and deal with them as a monolithic group.

Taking the organisational diagrams interviews and information straight from the companies in the NPP (especially at the Basic Complex) we have found that the total number of managers is smaller than the profiles would suggest. From the profiles (section 5.3.1.) the pole would have approximately 560 'Executives' including those companies under project (table 5.2).

Excluding the bigger companies such as COPENE, NITROFERTIL, NITROCARBONO, ISOCIANATOS, COBAFI, DOW QUIMICA etc., the majority are companies with few executives, less than 10 on average, which makes the total fall short of five hundred. This is explained partially by its high technology. Industries using a less capital-intensive technology would have more managers. As management is a scarce factor in underdeveloped areas this may well be a good reason for using the petrochemical industry on NE Brazil. That confirms M rawetz (1973) finding in his research on Columbia's petrochemical industry about the management saving nature of that industry.

#### 5.6.2. Management Development

On talking on this subject, the question 'can management be taught?' is often raised. The literature on management development is generally very sceptical about the way teaching courses on management are run, but in one way or another, the authors point to difficult sort of knowledge or skills that can be taught. Torrington (1976), for instance, states that 'the development of managerial resources should be one of the main activities in an organisation'; Drucker (1969) finds that effectiveness for managers can be learned; Mintzberg (1973) relates the efficiency of managerial training and development to the right selection of the candidates. Most important of all the arguments is that the existence, growth and acceptance of management courses by the business world is a support to those who firmly believe that suitable courses can contribute to the improvement of management. Moreover, the making of business policy decisions and the practice of management deals with the process of learning, planning and forecasting that require knowledge, techniques



and skills that have to be learned by continuous study and not only work experience. The existence of managers who come into the profession by means of marriage, birth, work experience, natural leadership and wealth, does not deny the modern common practice of accepting Schools, Institute, Universities and the like for the training of management. What is in debate is the ability of those above-mentioned bodies to teach management effectively, how to teach it, what to teach and so on.' Copeman (1959) comparing different managers in the USA, Britain and West Germany, has shown that even many capitalist managers - 'capitalist' here meaning those who own the company they work for or who have the majority of its shares - have also received professional education. Of course Universities are institutions of education and instruction, but there are some teaching activities that can be better performed by industries or even by specialised Agencies such as CEPED/CENDRO. It is a fact that universities traditionally are academic institutions and tend to look down on vocational training. They are devoted to education rather than training. The Universities are responsible, however, for the development of general skills, the provision of present and future managers with an overall understanding of their profession, the handling of management techniques, etc. On the other hand, there are some selected fields where both training and education are embraced together for managers as for other professions. What is wrong is to alienate Universities or any other educational institution from the development of the community, under the assumption that they are only for general purposes, having nothing to do with the specific development at Camacari. There is, however, a straight and close relation between education and training and management development. Badly educated managers require more effort from their trainers and they also will need more rigorous development programs.

Time is another very important point. As the Universities are geared to long-term courses undergraduate and postgraduate programmes of one to four years, their courses are not designed to serve the specific requirements of particular industries in the first place. These requirements are dealt more effectively with medium-term courses, where industries can release their employees for part-time attendance - or in the case of short-term courses even on a full-time basis.

The principal courses preparing managers for the petrochemical industries (IBP and CEPED courses) were made at this medium-term with targets of 120 hours tuition on a part time basis. There is no reason, however why these courses could not be run in conjunction with the local universities. In fact the wide range of subjects and the continuity required in the process of training demands the close cooperation among all the Institutes of the local infrastructure of knowledge, if it is to be a success.

#### 5.6.3. Management Courses

Despite some ups and downs, this sector has received great attention from the planners of the pole especially by the promotion of courses, conferences and seminars open to those already working in the petrochemical industry.

Bearing in mind what we have written in the previous pages about the necessity of using all the resources of the region for a full development of the pole, the jettisoning of any important Institution from the process can be prejudicial if not in the short, at least, in the long run. But both the universities with their respective departments of Social Sciences - Economics, Business etc - are kept apart from the major industrial development at Camacari. There is no valid excuse for that, since management for petrochemicals is not a special case. What makes it different at Camacari is the large scale of the project, not its nature. So, there is no point in keeping the local Institutions

of Education apart from the development of the pole, especially if we think that Management Development cannot be a once-for-all training but is spread over a long time.

In the following page, a scheme is proposed of some subjects that should be considered in a managerial development program in the NPP. The pattern is based on the literature about this point, on the realities of the NPP as shown in chapter One and Two and on the nature of petrochemical industry (chapter Three).

The problem is that time is not available to provide effective general courses for all the managerial staff of the companies in the pole, since the roll of subjects is too broad for a short term course and the industries need their staff and so cannot release them to participate in long term courses. Of course, all that range of subjects (see next page) is not under the responsibilities of a single executive. They should be separated into small and related groups, according to the functions and level of the manager. A line manager is certainly more interested in the technical side and operations of the industry, than in the structure and philosophy of government agencies, such as the CDI, SUDENE and BNDE. Those aspects, however, are becoming increasingly important for the top executives of the "pole", since they often need to make major decision on policies that involve those Agencies which back the pole financially. They need to be prepared to deal with them.

Scheme:     Some Aspects to be considered in a Management Development Program.

Knowledge of	Aspects to be considered
- petrochemical industry	Its characteristics, products, technology dependence, technology absorption, production processes, marketing
- Management	Organisation criteria, traditional management functions, Analysis and evaluation of projects
- Environment	<p><u>Physical:</u> infrastructure</p> <ul style="list-style-type: none"> <li>- general means of transport, accommodation, provision of facilities for workers, etc.</li> <li>- The linkages of the industries and its effects on the whole project</li> </ul> <p><u>Political:</u> The North East dev't:</p> <ul style="list-style-type: none"> <li>- Stability, possible changes of policies, alternatives to be followed in case of changes, the policies of industrial decentralisation.</li> </ul> <p><u>Internal:</u> shareholders consumers Historic reasons of the pole.</p> <p><u>Institutional:</u></p> <p>Parent companies Shareholders Government Agencies National Financial System Government Incentives "Macro" and "micro" economic trends of the economy.</p>
Skills	Analysis Judgement Social

(a) Knowledge

The content of a course must be based on the knowledge of the industry they are dealing with, its environment, the forces behind its existence and the overall characteristics of the market, that is to say, the contents of a course should be based on the main objectives of the managerial function but with an industry bias. Ansoff has described those functions as being (a) resource management, (b) structure system management, (c) operational management, (d) external relations. He warned, however, against the top management involving in truly operational areas. We agree with Ansoff in that the knowledge of the industry is necessary, but not for the higher executive to take over operations functions. The course should be used for a better and more understandable coordination, for evaluation of the operating units and also for the whole analysis of the business in its environment (Ansoff, 1968). In other words, Ansoff's arguments point to the need of a common general knowledge that can be complemented with a more specific knowledge of the industry. The general knowledge is how to manage and the speciality varies according to the industry.

Due to the relatively recent arrival of the petrochemical industry in Brazil, where there is no specific region or class that can be considered specialised in this field, the only option to obtain managers was to have people from different backgrounds and give them intensive knowledge of the petrochemical industry and its managerial requirements. There is not the option of having a manager and then training him for the industry or, the other way round, having a specialist and afterwards giving him managerial training. The only available correct approach is to take advantage of the available human resources and afterwards give them a uniform training comprising managerial knowledge plus specific insights into the petrochemical industry.

(b) Skills

The skills are the abilities managers need to perform their functions. The knowledge only is not sufficient. It is necessary to know how to put it into practice and that is a skill. In general terms, we can say that a skill is required for the application of any single area of knowledge. A Finance Manager, for instance, can be an expert in finance. His function, however, requires from him besides the knowledge, the ability to interpret different environmental variables that may affect the performance of his firms, to take part in the executive structure, to make decisions, to exert leadership and so on. His success will hinge on his ability or skills to use all the knowledge he has to make the correct decisions in the right place at any time. So each manager needs skills in his normal functions of planning, controlling, organising, decision making and motivating.

What are, then, the skills required for the managers at Camacari? The answer lies, again, in the analysis of the functions of the pole managers. Managers have to deal with public authorities - BNDE, CDI, SUDENE, Ministry and State Secretariat for Finance and Taxation etc - they have to make decisions on administrative and 'macro' and 'micro-economic' issues, to interpret the environment and trends and to motivate their own subordinates. The priority should be given to those skills most important for the manager's job. Roughly speaking, there are as many skills as the roles a manager has to perform.

In summary, the skills required by the pole can be classified in three basic groups: (i) analysis - to understand the problems as they arise, to select the right technique to be used, (ii) judgement - to choose among several possible decisions and (iii) social or interactive that relates to leadership, communication and ability to work in group. A planned strategy to develop these skills must combine techniques to teach both knowledge and skills to managers of different levels in the hierarchy.

(c) Behaviour

Besides knowledge and skills, we may think about the proper behaviour of the manager in his work and outside. This has been a major subject in the seminars designed for 'executives' at the petrochemical industries in the NPP. The behaviour of managers can be a crucial factor in the coming years, when the society acquires a more active voice in the affairs of the pole. Camacari has been criticised on the ground that its planning and implementation was carried out without the necessary minimum of local participation, and this must call for a more close pole/community relationship in the future.

5.6.3. Management Development Practice in the NPP

After writing about the nature of management development courses let us say something about the perceived effectiveness of those courses at Camacari. A study undertaken by CENDRO (see two following tables) has presented us with useful information about the value the participants have given to those courses. The study was based on an evaluation of the courses by the participants mainly but also by other persons involved with the management development programs.

The comments began by criticising the way the groups were selected. The participants have found the groups were too heterogeneous (people with different academic and work background), and the majority stated that this condition was hampering the development of the course.

Table No. 5.11. Opinion of the Students about their respective groups in The Management Development Programs.

Composition of the Group	Percentages	
	Seminars	Courses
a) Homogeneous - adequate	30	8
b) Heterogeneous - adequate	30	23
c) Heterogeneous - Inadequate	29	54
d) Not declared	11	15

Source: CEPED/CENDRO -

The majority of those attending to the seminars found them adequate, notwithstanding diverging on their perceptions of the structure of the group (homogeneous or heterogeneous). These categories refer to the academic background and work experience of the participants. The participants of the courses, however, found the structure of their groups inadequate for the kind of program they were attending.

The criticisms were also directed on the contents of the course. (Table No. 5.12).



Table No. 5.12.

Main criticisms made by the Participants to the Management Development Courses in the NPP (The percentages are not mutually exclusive)

Criticisms	Percentage
- Inadequacy of the learnt knowledge	15.0
- Superficiality of the subjects discussed	46.0
- Absence of specific managerial aspects	30.0
- No faulty aspect	23.0

Source: CEPED/CENDRO -

These criticisms are very important, since they were made with those who attended those courses and seminars after the events took place. The proportion of those who are unhappy with them is excessively high. It seems that the attempt to cover many subjects and develop many skills has led to heavy criticisms as shown in Table No. 5.12. (See also the contents of The Management Development Program for Petrochemical companies, that were given in Salvador in the next page).

Management Development Program for Petrochemical Companies

1. Introduction: Chemistry ( 6 hours)
  - Hydrocarbons
  - Main organic compounds and their classification.
  - Processing of oil and derivatives.
2. Basic Instruments ( 30 hours)
  - Financial Mathematics,
  - Profitability and Investment Alternatives
  - Accountant and Balance Sheet Analysis
  - Economic and Financial Planning of the Firm
  - Organisation.
  - Financial Aspects.
3. Petrochemistry (24 hours)
  - Characteristics
  - Main sectors of the petrochemical industry (Basic products, intermediate products, plastics, fibres, elastomers, detergents and other products and inputs).
  - The petrochemical industry in the World, in Latin America and in Brazil.
  - Raw materials and the strategy of their utilization.
4. Projects of the Petrochemical Industry (59 hours)
  - Basic concepts on petrochemical projects.
  - Incentives for the implementation of the Brazilian petrochemical industry.
  - Marketing aspects.
  - Locational aspects.
  - Technical aspects.
  - Investment estimates
  - Financial schemes
  - Production and Commercial costs.
  - Profitability estimates.
5. Case Studies.

(Program of the IBP - Instituto Brasileiro de Petróleo).

Taking the two tables together, it can be seen that the majority of the participants were dissatisfied especially with the courses but also with the structure of the seminars. That indicates that those activities have not fulfilled their objectives. Furthermore, as they were just a discontinuous activity - the courses were held in 1974, 75, 76, 77 - but cancelled in 1978, there is a very important gap to be filled. Effective training cannot be held at occasional basis, let alone, development and education programs. Here, another strategy should be built on a mixture of short, medium and long-term bases, which are proposed later on under section 5.6.5.

(a) Costs

The following diagram of the financial resources provided for the realisation of management development programs points out that the problems have begun since the early stages of planning. Those who really pay for the training are not the firms, but the government. This casts some doubts over the interests the firms have in the courses and also on the necessary support of their top management.

Table No. 5.13 Resources for petrochemical courses provided by CEPED (CR \$ 000')

Sources	years				
	74	75	76	77	78
PNTE (CEBRAE) - Federal Gov	978	1.742	1.820	4.300	.945
SME - State Gov.	50	50	50	-	-
Participants (Firms)	50	612	1.525	2.802	3.835

Source: Field research - Cendro.

It is a well known fact that no management development program can succeed without the backing of its own organisation. Although it can be argued that the organisations did not need to pay, because the funds were already provided by other sources. That is not true, since a development program for petrochemical management was cancelled in 1978, because the PNTE/CEBRAE refused to subsidise the course, on

the grounds that their main policies were to support development programs for small and medium companies, but not for the medium-large companies of Camacari. The companies did not cover the costs. We are not saying that the success of a course depends on the amount of money the companies spend on it. The point here is a lack of commitment of those companies to the petrochemical management courses, and also an absence of clear objectives of those training programmes. The objectives of individual managers could not have coincided with the aims of the planners of the training programmes. There is no management training without coherent, continuous and top backed plans. In some way, the internal analysis of the firms' general objectives may draw the basic lines regarding its programs for managerial development. So, management development is not an independent variable in a company. It is an inside part of its philosophy, of the beliefs of its board, its participants such as the government agencies, the banks and multinationals. Managerial development starts at the board which has not been the case at Camacari.

(b) Technology Transfer to Local Managers

The objective of a production department of any firm at Camacari is above all to absorb the new technology that is required, together with its proper function of making goods.

Looking at the way the functions are distributed among the shareholders under the tripartite policy, we realise that the foreign partner has generally the control of the production department. In fact, the performance of this sector can be regarded as a thermometer of the companies, which should always pay close attention to its developments and results, since it has a catalyst function to promote new interactions among the regional research and development Institutions. Even, if a foreign manager is better qualified to head the department due to his technological background and his knowledge and skills, the regional manager would have more advantages in his relationships with the environment. He is better placed to promote cooperation and interactions with the network of education, research and development.

Motivation is an essential factor in the performance of any job, so one should ask if the foreign executive is the most motivated man for this technological transfer. That is very doubtful, since they have no major interests in the region other than to finish their work and dash off again on the way back to their own countries. Further research, however, is necessary to find out the linkages between those executives and the North East region. Researchers elsewhere on this 'subject' have already shown that they are not always trusted by the local with whom they have to work. Their major loyalty is towards their parent company (Vernon 1971, Servan-Screiber, 1968; Pinelo, 1973).

Meanwhile, studies on the absorption of technology by the pole firms have shown extremely poor results. Probably, it is a bit early to assess this topic on conclusive terms, let alone, to measure the influence foreign managers had in this slow absorption. However, the prospects of technology transfer do not look good. It is sufficient to verify the proportion of professionals and other technicians who have been offered effective training. We will make further analysis on this item in the following headings about the professions and the skilled workers. This does not mean that training by itself brings technology, but that is, at least, an essential step to it, which can be drawn from the very nature of the contracts of technology supply made with the multinationals. An analysis of the the contracts for technology transfer of petrochemical firms at Camacari have indicated that the items "technical assistance", "provision of technical knowledge through personal training and instruction into the technical plans, diagrams and models" are among the top objectives of a contract of technology.

The efficiency and effectiveness of the management of these projects of transfer of technology should be effectively monitored. The Ministry for Industry and Commerce in Brazil through the INPI, an Agency which cares for the registration and performance of those contracts, has concentrated its efforts on the problems around the purchasing of the technological process which is an important but not sufficient step. There is a need for additional efforts to analyse the process and evolution of those contracts. As technology is becoming an important item in the imports/exports balance of any country, its acquiring and management deserves a careful approach.

As the trend in the modern world points to the need for continuous exchange of technology among different countries, developed and underdeveloped, these acquisitions must be brought under a rationalised process.

#### 5.6.5. Strategies

From the problems discussed in the previous section, it is clear that another strategy has to be devised to prepare the right Brazilians to occupy managerial functions in NPP. In spite of the fact that the public authorities have shown some concern towards the preparation and training of the managerial staff, the measures taken up to now have failed at least in two grounds:

- (i) they have been only short-run therapy and have ignored longer term strategies and,
- (ii) they did not involve the educational and scientific infrastructure in their attempts to develop the managerial strategy of the pole.

A shift in those policies is the first priority of of a new strategy in this field.

##### (a) Short-term Strategy

Short-term programs remind us of the most pressing needs of the pole. Where you begin an activity which is unfamiliar and you do not have much experience in it, you need at least a recipe of how to do it, when and what for. That should be the goal of short-term courses, conferences, seminars, meetings, everything that can be made to improve the performance of the present managerial staff of the pole.

Their needs are far more specific and practical. In this situation, a survey of the most vital problems should be urgent and permanently made in order to prepare the best way to cope with them. From the analysis and evaluation of projects, the institutional framework of the Federal and State Governments are topics important for all the managers.

A common mistake in the strategy adopted at Camacari was the provision of medium-term courses - 3 to 6 months in length - for short-term problems. These problems require small groups dealing with the specific problem and intensive teaching. The main obstacle here is how to prepare those courses, to select the groups. We dare to say that the problems related

to their work are easier to cope than all the work undertaken to prepare the previous courses of petrochemical management for a wider audience.

(b) Medium-term Strategy

The medium term strategy is based on the development of programs envisaged to attend the needs of the pole in the next three to six years. As the local environment is not mature enough to provide all the requirements of high level executive programs, that could be complemented by on-the-job training programs, and also courses run by the firms in conjunction with the local Institutes to be attended by those people interested in the petrochemical business.

The large companies, especially the State-owned enterprises, such as Petroquisa, Petrobras and other companies outside the area could provide a good ground for cooperation. This program, however, should be made on a continuous basis, with frequent short courses, for instance. A combination of an intensive course including the teaching of the hard core knowledge an executive needs to have and stages on industries and on Government units would be more recommended than the middle length courses that have been given up to now. An important point in this program is a new emphasis on the "macro" economic and managerial problems of the pole, that were not sufficiently developed in the previous courses. In an organisational structure similar to the one established at Camacari, the managerial staff must be sufficiently trained to understand the regional needs, the role of the Federal, State and Municipal Governments, especially, those Agencies that were involved in the planning and implementation of the pole (SUDENE, BNDE, CDI, etc) and that provide funds for the infrastructure and also for the capital of the firms. Besides, these aspects, the managers also have the classical administrative functions they should know very well.



Although the companies have already chosen their staff, they should pay close attention both to their own employees and to potential outside managers to include in their programs. In one way or another, there must be a program to develop new managers for the NPP, even due to the needs for the down-stream industries the pole urgently needs. The serious obstacle for a common program here is that each company has its own set of problems.

Assuming that the companies have selected a hard core of good potential managers, a medium-term strategy can be effectively developed by running new regional prospective managers as Assistants, trainees or the like without power and alongside the senior Managers. These new potential managers can in this way have a learning practice in a work atmosphere that can be complemented by short or medium-term courses of a very specific nature.

A useful idea is to form groups of representatives from different companies with similar responsibilities to have a common training program in the specific questions of management. The program should continue with on-the-job training of the participants in their own companies and, at a later stage, another common program in "macro" questions that concern them all.

(c) The Long run strategy

The training of managerial staff has no easy and quick solution. Effective and serious work can be made only in the long run. The idea is to develop the infrastructure of knowledge, involving all possible institutions in this field. Particularly important is the involvement of Universities and all other Institutes of Training.

There are a lot of ways to put these suggestions into practice. One is to pick up students with different background and give them specific knowledge of the petrochemical problems at their own area of study. That is to say, Chemistry students could have one-year practical study in industries, the same could be applied to the different branches

of Engineering, to business, economics, etc. Another idea is to create post-graduate courses for those already involved in the business of petrochemicals. These courses involving all the infrastructure of the area would provide a substantial basis for future executives for the companies. We cannot expect that the executives would come out from these programmes, ready to take their jobs as managers. The point here is that, on a long term basis, the efforts would create an appropriate climate for the development of executives. A selective recruitment is a requirement for good training in specific technology, particularly at the top hierarchy of business. What cannot be expected is to have managers emerging from an environment deprived of a fertile field for them to grow their roots. Moreover, besides the companies already in operation at Camacari, the pole has also the function to attract new downstream industries to it. The future strategy then is to put emphasis on every field of knowledge, not only on the technical ones, that could lead to the appearance of those men who will be competent to run both the basic and the downstream and supporting firms in the coming years.

#### 5.6.6. Conclusion

Despite the comparatively small number of managers needed for capital-intensive industries such as petrochemicals the firms at the NPP have not applied substantial financial resources needed for the managerial development programs. The Government has given support to some development programs, but this is not enough. The firms must play a major part in the exercise.

Due to the problems involved in the contracts of transfer of technology, where there is generally a heading for technical assistance, it is very difficult to assess the effective amount of resources the companies are putting to acquire for themselves their respective know-how. The training

of Engineering, to business, economics, etc. Another idea is to create post-graduate courses for those already involved in the business of petrochemicals. These courses involving all the infrastructure of the area would provide a substantial basis for future executives for the companies. We cannot expect that the executives would come out from these programmes, ready to take their jobs as managers. The point here is that, on a long term basis, the efforts would create an appropriate climate for the development of executives. A selective recruitment is a requirement for good training in specific technology, particularly at the top hierarchy of business. What cannot be expected is to have managers emerging from an environment deprived of a fertile field for them to grow their roots. Moreover, besides the companies already in operation at Camacari, the pole has also the function to attract new downstream industries to it. The future strategy then is to put emphasis on every field of knowledge, not only on the technical ones, that could lead to the appearance of those men who will be competent to run both the basic and the downstream and supporting firms in the coming years.

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Due to the problems involved in the contracts of transfer of technology, where there is generally a heading for technical assistance, it is very difficult to assess the effective amount of resources the companies are putting to acquire for themselves their respective know-how. The training

of new managers in new technological processes, however, seems to have received a blow under the present composition of the Managing Board of the different companies in the NPP, where the technological areas are under the control and responsibilities of foreign managers, who could not give the interest or priority to this transfer of technology.

Also, the courses of Managerial Development Programs held at Camacari have come under heavy criticisms from everyone involved - participants, companies and finally from the Government Agencies which have now withdrawn their support refusing to give more subsidies to them. The implementation and operation of the pole is, then, requiring a change in the managerial development strategy which should stress the strengthening of the infrastructure of knowledge, involving all possible institutions in this field in the long run.

#### PART IV

##### 5.7. The Professionals and The Technicians

5.7.1. Concepts

5.7.2. The Professional Group

(a) The Universities of Salvador

(b) Specialised Institutes

(c) The University of Camacari

a.1 ] Factors supporting the

a.6 ] creation of the University

(d) Appraisal

(e) New Strategy.

5.7.3 CENTEC

5.7.4. The Technicians

5.7.5. Proposed General Strategy

(a) The Professional

(b) The Technicians

##### 5.8. Skilled Workers.

## 5.7. THE PROFESSIONALS AND THE TECHNICIANS.

"The kind of activity carried out by the whole range of technician engineers and other technicians is basically very similar with a wider area of overlap between the two levels than had been expected. For example, there is little evidence to indicate that the activities of planning evaluation, control, etc, are any more within the scope of the technician engineer than of his counterpart at a lower level. Nor does the former spend substantially more time on supervisory activities. Similarly, the technician engineer does not spend very much less time on the relatively simple activities of measuring, testing, inspecting, etc, than does the other technician." (Roberts 1972).

### 5.7.1. CONCEPTS

To state that professionals are those people with university degrees and technicians those who have completed the Second level of Education (Secondary School) or have an equivalent degree is an over-simplification of the concepts of professional and technician. We are very conscious of the weaknesses of those concepts but we have allowed them because we will deal with this education tool as an important element in this section. Furthermore, there is another category between the technician and the professional, that is called in this paper technologists, who are holders of degree equivalent to a short University program - two to three years in length. Of course, much more can be said about professionals and technicians.

Basically, there are many more differences between the intellectual and conceptual content of the liberal and scientific profession and the skill base of the technician who is concerned with the application of technology. By and large, the professional is educated, the technician trained; the professional is expected to have a broad liberal University education, the technician to have been trained to a required level in narrower skills; the professional work is non-routine, while the technician is tied-up to specific operation (Toren, 1975 Harbenstein, 1963, Charnock, 1977). In the first category, we are dealing generally with the traditional liberal professions, such as Economists, Engineers, Doctors and so on. In fact, in the past the concept of professional included only the Church, Medicine and the Law, but today there is a broad movement to consider as "professional" many new occupations that are already accepted as such or that are claiming that status. There seems to be two contradictory movements: one which admits a growing number of 'professions' in our society; the other which stresses a continuous deprofessionalisation. Charnock has made a thorough analysis of the concept and its evolution, applied especially to the notion of a Bank Manager as a professional. Harbenstein made a study on the new occupations that deserve the status of 'professional'; Etzioni (1964) introduces another category called 'semi-professional', while Bell (1974) visualises a society with a significant role for the professional and the technician. Millerson (1964) examines several definitions of the professional concept trying to extract its main characteristics.

On the other hand, Hickson & Thomas (1969) foresee a decay in professionalisation by the elimination of conflict between the professional and the bureaucracy; Hughes states that 'professional' is no more than a 'symbolic label for a desired status, while Harbenstein sees it as simply a 'status claim'. Hertzberg (1968) sees some relationship between

the professional claim and the search for money and status, and Lawrence and Lorsch (1967) are against generalisation on this concept since it varies according to the environment where it is immersed.

These attempts at defining the concept 'Professional' or identifying its characteristics show that there is not a unanimous view on this point. They also show that other occupations not included here as professional, such as the managerial staff discussed in the previous section, could also be classified as professional (Thomas, 1976, Drucker, 1952, Nichols, 1975). There is no use in arguing for or against these concepts, but only in justifying our oversimplification as an operational tool for this work.

According to the categories we have used here, this group is not the critical factor in the pole as far as supply and demand are concerned (See 5.3 and 5.4). This does not mean that the problem is over. On the contrary, it is argued that the importance of this group stretches far beyond the simple question of supply and demand, since the professionals are virtually responsible for the main task of absorption of technology and their qualifications can be much more important than their numbers.

They are an important part in the process of transfer of technology. The strategic importance of this group should be measured in relation to the bulk of knowledge they represent. They are responsible for the development and application of technology, making it available to the technician, who is unlikely to have the knowledge to initiate or understand the implication of the technology from first principles. While the technician has the "know-how" to put a plant into operation, the professional must have the "know-why" that plant is going into stream. The "know-why" is then made available as "know-how", a limited, more easily learned segment of the whole broad technology. In this operational sense, professionals may be very unskilled, unable to perform the skilled individual tasks as effectively as the technician.



The very notion of technology transfer implies that the local technical-scientific staff are not capable of performing a particular function without outside assistance. But it also requires from the same staff a latent capacity to learn a possession of the necessary general skills and a very good background for the specific know-how they need to learn. Technology is not a simple problem of individual training; it involves a determined entrepreneurial policy and the support of many Institutions for Research and Development.

In this section we are dealing with the policies on both the professional and the technical groups and the parallel Institutions which are behind them.

#### 5.7.2. The Professional Group

The implementation of a petrochemical complex reminds us immediately of the high level of Chemists and Engineers required to conceive of its processes and put it into stream. In effect, there is a reference to this problem in the majority of the technological contracts written by the Brazilian Government with the foreign holders of the technology. Some of those professionals come directly from the parent companies which set up a branch in the pole; others are recruited by the company where they are available and sent to different plants for company-specific training, which is the crucial problems for those professionals.

##### (a) Universities of Salvador

The Universities of Salvador have the capability to supply the pole with the required workforce. Those Institutions, however, are not specialised enough to help them with specific training. Of course, I do not refer to the peculiar skills of each industry, but to the specific requirements of the petrochemical business, that theoretically could be taught at the University. But on the other hand, the "Universidade Federal da Bahia" had introduced some subjects designed for those who wanted to pursue a career in the petrochemical industries. The response of students was insufficient for the Bahia University to feel encouraged

enough to proceed with similar proposals. It could be argued that the University has introduced those subjects to the wrong people, offering at the wrong time a first degree wherever these specific and more specialised subjects are better taught at postgraduate courses. The first undergraduate degree - is intended to provide the basic scientific foundations of a subject, such as Chemistry or Biochemistry; A second degree, to build and specialise on those foundations, such as the chemistry of molecular changes into hydrocarbons.

From that point there arises the whole question of applying the research knowledge of a whole group of scientists to the development of the scientifically feasible to the practically possible in real terms. The putting together of such a group of development scientists, and making it work is not likely to happen at a University but rather in a more practical and entrepreneurial environment in which University and industries cooperate. For a University whose adaptation to the industrial requirements is considered to be poor, the failure in putting on the petrochemical course was a serious blow. The Brazilian Universities, as in the Third World in general, are heavily criticised, from the point of view that they prepare people for the academic world only and not to the realities of the labour market. Beyond those criticisms, the pole must be aware that the University does not have a tradition in the petrochemical technological process and, therefore, it is not ready yet to spearhead the job of training highly skilled professionals with key posts at the industry.

(b) Specialised Institutions

On the other hand, firms need the support of the scientific infrastructure of the academic world in order to be able to get together to turn theoretical and practical research into results and products. Instead of the University, this task could be fulfilled temporarily by other Institutions. The CENPES, even without being physically in Bahia, is considered in this study since it belongs to PETROBRAS whose

subsidiaries have most of the work at Camacari. Moreover, it has a section CENPED-BA in Salvador. The CENPES is open not only to the parent company, but also to all the companies of the PETROBRAS pool.

CENPES is by far the most important centre for petrochemical research in Brazil, by any standard of comparison we adopt. It has more tradition, more financial resources; more important and above all, its main function is in the area of oil and petrochemicals.

The main influence of CENPES in Bahia was felt in the agreement jointly signed with the Universidade Federal da Bahia for the preparation of Chemical Engineers.

As regard to CEPED, it was founded to promote research and development in Salvador and also to serve as a basis for the local industrialisation programs. But its main centre devoted to training - CENDRO - lacks resources to embark on a large scale training program for the pole. Moreover its main resources for that purpose come from the Federal Government via CEBRAE/PNTE, a program set to encourage training executives, especially in the small and medium industries.

There are several Institutions devoted to the training of the professional people required by the pole. However, they are short of resources to accomplish that function. The solution seems again to lie on close cooperation among all the Institutions at local and national levels. A surprising point, however, is that instead of pursuing policies of cooperation and of strengthening the already existing Institutions, there has been an attempt to create another University, namely the University of Camacari.

(c) The University of Camacari

The arguments put forward for the need of that Institution were based mainly on the pole itself. The University would be an instrument of research, development and teaching new techniques, and it would help the transfer of technology. As the industrialisation process was already on its way, there would be a need for a higher education Institute to prepare its workforce.

The project argues that the factors favouring the creation of the University of Camacari has called attention to three tenets that should be necessarily observed:

- (i) the expansion of the formal education and training system to improve and widen the opportunities of learning;
- (ii) modernisation and qualitative improvement of those systems to cope with the technological expansion of the pole;
- (iii) Regionalisation of the location of Universities to take care of the demographic demands and the specific requirements of each region.

Of course, we can agree with those three tenets without favouring the creation of a University at Camacari. Even the regionalisation of locations could be reached without that University. Camacari is part of the Greater Salvador and the regional policies for major issues that involve the metropolitan population should not be regarded under the narrow local (Municipal) point of view. Salvador has already two Universities and Feira de Santana - the second biggest city in Bahia has its own University only approximately 60 miles from Camacari. The idea of regionalisation of location and of widening the opportunities of learning in Bahia instead of favouring Camacari, would drive any new University away from it because there is already more opportunities and universities in the RMS than in any other part of the State.

The strongest argument seems to lie on the peculiarities of the industries settled at Camacari. It is argued they need specific courses, that could be better provided by an Institution devoted exclusively to it. Of course, at the pace the petrochemical pole is developing, it will require more specialists to meet its own needs. Here again, the problem is two-fold. First of all, the specific requirements of the petrochemical industries would be hardly attended by the University that must have a broader scheme devoted to research and development. Secondly a University should not be a simple training Institute. It has general aims to perform that go beyond the teaching of specific skills for a particular

industry. But an advanced section or department of the existing University or with CEPED to build up postgraduate studies and research in specific areas of petrochemicals is a better possibility. A decentralised department might get the required commitment to get along with the development of the pole and its needs of Research and Development for the industries. An input of money and teaching staff from within or outside highly trained both academically and industrially, could keep the department firmly on the ground, without facing higher costs of Administration of a completely new Institution.

The project for that University proceeds with a statement of the facts that could lead to its setting up. The main facts reported are commented below:

- c.1. An Alleged existence of adequate resources for the installation of the University, laboratory, libraries and human resources such as teaching staff, researchers, teaching assistants and lecturers, administrative and technical staff, maintenance of basic courses at the undergraduate and postgraduate levels.

One of the common fallacies of those proposing the creation of Universities and Research Institutes, in underdeveloped areas, is the belief that the availability of adequate Installations, is sufficient to justify the installation of a higher education Institute. Even other institutes with good technical record, and with good support and background, such as CENPES, very often have difficulties in operating those hardware sets. The Key area here is the quality of the personnel who could work for the new University, or Institute. However, the Municipality of Camacari has undertaken a survey at the town to show the existence of professionals in the area to back the formation of a new University. (Tables No. 5/14,15 and diagram No. 5/1).

Table No. 5.14.

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 Professionals working at Camacari with Postgraduate Degrees.
 

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Courses	Master	Phd
Chemical Engineering	19	2
Civil Engineering	10 + 2	-
Economics	05	-
Business Administration	04	-
Agronomy	03	-
Medicine	03 + 1	-
Electrical Engineering	01	1
Mechanical Engineering	01	-
Chemistry	01 + 2	1
Architecture	01	-
Accountancy	01	-
Nursery	01	-
Physics	-	1
Psychology	01	-

Source: Municipality of Camacari

Note: Numbers preceded by + refer to spouses with a respective degree in the given course.

Table No. 5.14.

## Professionals working at Camacari with Postgraduate Degrees.

---

Courses	Master	Phd
Chemical Engineering	19	2
Civil Engineering	10 + 2	-
Economics	05	-
Business Administration	04	-
Agronomy	03	-
Medicine	03 + 1	-
Electrical Engineering	01	1
Mechanical Engineering	01	-
Chemistry	01 + 2	1
Architecture	01	-
Accountancy	01	-
Nursery	01	-
Physics	-	1
Psychology	01	-

Source: Municipality of Camacari

Note: Numbers preceded by + refer to spouses with a respective degree in the given course.

Diagram: Relation PhD/Master Degrees of the Postgraduates  
No. 5.1.  
who work at Camacari.

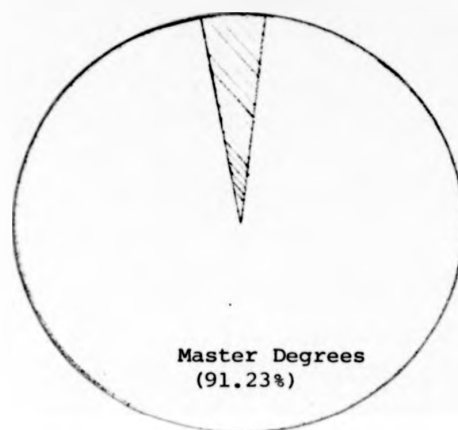


Table No. 5.15 People who can contribute to the University  
based on the population forecasted.

Year	Population	Assuming that 5% of the population can contribute to the University.
1977	85,400	4,270
1979	123,815	6,191
1981	147,776	7,389
1983	189,502	9,475
1985	259,022	12,955

Data worked out by the Municipality of Camacari - Project for the  
University of Camacari.



That should be followed by a research into the willingness of those professionals to either change their jobs or work as part-time lecturers. Even so, the mere existence of highly-educated people in industry does not mean they could undertake a University job. Teaching Engineering, for instance, is different from working as an Engineer. The knowledge could be the same, but the skills required are distinct.

A survey of the spouses of those living in the area makes no reference to their professional lives, which diminishes their significance as far as working is concerned. They could have been working already or even may be not interested in University posts and fully engaged with children.

C.2 Demand not fulfilled by the already existing Universities which have no physical conditions for their expansion.

An unfulfilled demand is not sufficient to justify the creation of a University at Camacari, since this problem is common all over the NE (Chapter One). The requirements of the labour market are better justification. The actual number of jobs created at the NPP is not big enough to support the running of a University. Moreover, as the existing Universities have physical difficulties in expanding, so the logical solution would be to provide more resources for their expansion instead of creating another institution.

C.3 High percentage of professionals with high education degrees, graduates, Master and PhD's who put together, could reach more than 1.000 by 1980, added to a considerable number of researchers and other professionals of higher education at the CEPED.

The point here is that CEPED is already a State-owned Research Institute that could be strengthened in its activities. Why, then, duplicate efforts in making another research centre, if there is already one? The University of Camacari is an initiative of the Municipality, but one that will require more funds from the firms. There would be, then, two Institutes in similar fields and a clear diversification of resources.

It seems to be more a local vanity than a simple necessity.

C.4 The existence of the CEPED which has good stock of industrial equipment and research.

Many arguments for the University are based on the existence of CEPED as a research centre, which may lead to the assumption that the new body would be a dependent Unit.

c.5 The Integration University/Companies could open new sources of wealth and expand the market and provide the State with new entrepreneurial opportunities.

I do not think that the best way to expand markets or increase entrepreneurial opportunities is via the foundation of a new University.

c.6 Additional Claims

- The demand of the working class for skills while the industrial dynamics require an additional supply of qualified labour at all levels to keep up with industrial development.
- An area has already been reserved for the University Campus;
- A University at Camacari would also meet the demand of the neighbouring areas to the RMS.

That project concluded by saying that all those facts put together justified the creation of a University by the Municipality of Camacari.

d. Appraisal

I do not think that the arguments in favour of this new Institution are strong enough to justify the high investment it requires, especially when there are other institutions already working in the same field and at various necessary levels. It would simply be a dispersion of funds for investment which are already scarce. Moreover, if the main problems of the industries at Camacari, as far as manpower policies are concerned, are not related to the higher education level, there is no sense in founding another University when the present ones are sufficient to attend the demand.

## (e) New Strategy.

It is proposed that a good strategy for the professional group has other options. Instead of founding new Institutions, the emphasis should be put on cutting out the weaknesses of the present ones. In particular the fundamental courses in Chemistry, Mechanical and Electric Engineering and Management should receive special consideration. An example of this is shown in the course of "Petrochemical Engineering" given by the Universidade Federal da Bahia in collaboration with CENPES. It has been running for few years with the following results: (see table No. 5.16).

Other attempts made by the 'Universidade Federal de Bahia' to persuade more students to choose subjects leading to petrochemical activities have not been successful. Probably, the main cause is that students, for some reason, lack motivation during their respective courses, and so drop out. The percentage of those who do not finish their courses is particularly high and this is prejudicial to a country which has so many problems of education. A full research should be made into the causes of this high percentage of drop-outs.

However, it is essential to stress that there are professionals available but they lack specific skills of an applied nature so courses should be run to make the existing technically educated people more suited to the available jobs, which are highly demanding of specialised petrochemical knowledge. This is an indication that long term courses are not essential. On the contrary, emphasis should be put on collaboration among the industries and the teaching and research institutions for the promotion of specific courses and researches directly applied to their respective jobs. As a result of such an agreement, new resources would be available for:

Table No. 5.16 Enrolments and Conclusions in Professional Courses at UFBA

Y E A R S	ENGINEERING						CHEMISTRY		INDUSTRIAL CHEMISTRY	
	ELECTRICAL		CHEMICAL		MECHANICAL		E	C	E	C
	E	C	E	C	E	C				
1974	26	30	50	10	49	10	50	8	25	-
1975	50	25	50	18	50	25	65	8	-	13
1976	50	33	50	24	120	71	49	12	-	1
1977	50	29	50	63	50	61	49	14	25	14
1978	50	-	50	-	30	-	52	-	-	-

Source: UFBA

Note: E = Enrolments  
C = School leavers

- Reorganisation of the traditional courses related to petrochemical activities;
- Introduction of post-graduate courses for specialised subjects in petrochemistry; such as Engineering of Petrochemical Processing, Petrochemical Equipment Maintenance and so on.
- Strengthening of all Research and Development Institute with special reference to CEPED that is located just in the COPEC area, being already the best equipped Research Institute in Bahia and
- A long-term program for large scale training of scientific and technical staff for those Institutions.

#### 5.7.3. CENTEC

Running almost at the same level as the traditional university courses, the CENTEC is a new education centre fully designed to prepare staff for the local industries. It is situated in Salvador where it gives short post-secondary courses leading to degrees very similar but less academic and more vocational than those given by the university.

Centec's objectives are the development of courses for technologists ("tecnologos") at high level to deal with the peculiarities of the regional labour market. CENTEC accepts the cooperation of Universities and other bodies and Institutions with an interest in the field. Of course, the idea of the CENTEC is part of a total reformulation of the Brazilian University system, which is outside the scope of this research. Our interest lies only on the relation between CENTEC and the pole at Camacari.

Founded in 1976, by the Federal Law n.344, this Centre seems to be an important step towards the supply of specialised labour to the region. Its first years of experience, not sufficient for a definitive evaluation of its performance however, cast some light on the role it can play in the future. All the firms which were asked about CENTEC, especially represented by their Personnel Officers, have shown entire approval and satisfaction with it. They believe that the CENTEC can make a definitive

contribution to the human resource development in Salvador.

On the other hand, the feelings among technicians and students of that centre were completely different. These people find themselves in a situation where they neither truly belong to the university sector, nor to a second level of education. That is particularly important for the students looking for a job - they will probably have problems of lower wages and fewer incentives in a wage structure which overstresses the academic background of workers.

There is also a serious problem of status with both the professionals coming from longer courses and the public in general looking down at the mere technicians or at these technologists coming from courses shorter than those run by the Universities.

The idea of these courses was to provide postsecondary education that was short in duration and essentially non-academic, that is to say, essentially applied knowledge, whereas the traditional system of education offers 4 or 5 year courses intended to turn out candidates for the liberal professions, such as Doctors, Engineers, Economists and so on. The industries have many jobs for people with high education but not necessarily with one of these standards of liberal qualifications. These courses could be designed especially for the industries with their multiplicity of specialisms which require different levels of skills.

Perhaps, it is the need of the industries which made them welcome the CENTEC, whereas the prospect of leaving the University or a similar Institute without a liberal profession demotivates the students. Apart from this fact, the possibilities of promotion seem less bright for those with a "technological" qualification. In the way they stand up to now, technologists are a new rung in the educational ladder, with which we have dealt in Chapter 1.

The main difference between a university's leavers and the technologist lies in the character of the instruction they receive. The University is designed to give a general background and to produce professionals able to carry out research to develop their own field of knowledge; besides having a critical understanding of society. The training and education of technologists is directly related to the execution of their jobs.

In a way, the arrival of the CENTEC seems to have filled a gap in the preparation of manpower for Camacari. It can supply those technologists to the industries that truly need them to put their initial operations on stream. Really at that stage, the main problem is how to give a start to the industrial plants, how to make them work. At a latter stage, the need for research, development of new products would require other employees than technologists. But at the first spot, the urgent requirement is in the operational side, the field of how-to-do that is exactly where the technologists are inserted.

Looking at the programs and courses developed up to now in that centre, the following profile emerges.

Table No. 5.17 Courses Run by CENTEC

<u>Courses</u>	<u>Length (hours)</u>	<u>Students</u>
Petrochemical Processing	2,600	36
Petrochemical Maintenance	2,600	36
Telecommunications	2,600	36
Special Graduate Courses		
- Teaching Staff	3,600	18
- Electricity	3,600	18
Special Courses for Teachers		
- Civil Engineering	2	
- Chemistry	2	
- Electricity	2	
- Mechanics	<u>2</u>	8

Source: CENTEC.

"This is not merely a matter of new occupations being created although this is an important factor in the situation in all industries. The jobs now being identified and designated as technician jobs have been done in these industries for a long time past; it is only now that the industries are beginning to accept that the people doing them are technicians, and to think of them and describe them as such (p.39).

The advance of technology making the technicians' jobs more highly skilled, needing better education all the time, is a strong factor in this new acceptance of the technician. Technicians have to be specialised in their own piece of technology and well motivated and prepared to up-date their knowledge constantly within their general skill competence. The old idea of Taylor (1947) that all jobs can be split up in such a way that relatively unskilled labour can do their routines is being superseded by technology. Training and retraining again and again throughout the working life is now essential.

5.7.4. (a) Training of Technicians in Brazil is no exception to this.

The situation in Brazil is no exception to this. There are people who are employed in specific jobs which require a great variety of skills, for which training is not offered in the market. When a specific function is well defined, its responsibility established, its contents analysed and the skills that it needs are specified, the educational network system might well provide the necessary supply. But that is not the situation likely to appear in the initial process of industrialisation. There the functions can be defined for the personnel manager and for the specialist in project evaluation. Nevertheless, it is a long way to go from the plans as they are proposed to their effective implementation. Moreover, the functions most likely to receive special attention are those which, are accepted as requiring, more knowledge - the professions, but not the technicians. So it is not surprising that Camacari has



problems in supplying skilfull technicians for the industries, especially when there are still problems in defining the exact content of each one of those functions. In spite of the fact that the Brazilian Ministry for Labour has publicised a classification of functions, which is a useful guide for planning, it cannot include the peculiarities of all occupations in every single industry. For instance, the SENAI study, (1977), that we have commented upon before, on the supply and demand of labour had proposed some modifications in the contents of some petrochemical functions.

These make the work of training and formation of those technicians even more problematic. The insistence on the educational requirements for technicians, however, over-emphasises the role of instruction for those occupations. A great proportion of the technicians in industrial jobs in different parts of the world has got its respective jobs and acquired the skills to perform them without having the present required background. That is valid not only in Brazil, but in other developed countries as well (Roberts, 1972).

In fact by legislation, the First and Second level of Education should give the students a technical background, a trade or a craft as it envisaged. However, problems related either to the equipment of the schools or even to the preparation of teachers, mean this attempt at giving school-leavers a speciality for work does not necessarily allow them to go straight into the labour market. Lack of equipment and of trained staff are not the only problems of Secondary Schools in Camacari. In effect, there are some schools with brand new equipment for technical courses which are not running smoothly. Students have shown a complete lack of motivation and the number of drop-outs are extremely high, over 50%. Moreover, the State Secretariat for Education did not produce up to now a specific plan for education at Camacari.

The most serious problem in the running of those courses was in supplying the teaching staff on the experimental disciplines in petrochemicals. In fact, CENTEC had to call assistance from the 'Faculdade de Ciencias Aplicadas de Sao Bernardo dos Campos', in the Greater Sao Paulo (Metropolitan area). This reinforces our previous point emphasising the need for close cooperation among all the Institutions operating in this field. Furthermore, the need of a Faculty from outside the Region reveals the weakness of the local teaching units, which should be a pointer for a broader scheme of cooperation. The preparation of petrochemical manpower in Brazil as a whole could, then, be organised in centres around the present and future industrial poles. Sao Paulo, as the traditional centre, could lead the process by selecting fields of specialties for each centre.

The key point here is that Brazil cannot afford to waste financial resources in scattered efforts for the preparation of petrochemical manpower, when the solution lies in a national scheme.

#### 5.7.4. The Technicians

Technicians occupy an intermediary position between the qualified Engineers, Scientists, Technologists etc and that of the skilled manual workers or even the foremen. They are by no means manual workers, through their functions imply more "execution" than "decision" actions. Even their decisions are bound to operational tasks not to strategic issues.

It is broadly recognised that a whole range of technician careers are developed together with industrialisation. Technicians developed their skills in work situations and many times in on-the-job training programs. That seems to have been a general pattern. On this subject, Professor Roberts (1972) said that until the 1960s, the terms "Scientists, Technologists and Technicians" were used without a clear-cut demarcation line of their respective meanings. He quoted a report of the Committee on Technicians Courses and Examinations to illustrate his point.

Probably, if all the efforts dedicated to the creation of the university of Camacari were diverted towards the improvement of the Secondary Education, and to the training of technicians, the contribution to the overall problem of manpower planning at Camacari would be much greater. Even so, the Municipality has an important role to play at the bottom of the education hierarchy (see the next chapter).

#### 5.7.4 (b) Levels of Technician

There are two levels of technicians which are not always well distinguished, regardless of having different levels of responsibility. Our task, however, is easier since we know the industrial posts as they exist in Camacari nowadays and how they are classified. The first level of technicians corresponds to approximately 8-year-schooling, whereas the second level requires three years more. We call them the craft-skilled manual workers and Technically Qualified Operators respectively. In this section, we are concerned with the technicians at the second-level (11 years), leaving the first-level and the skilled manual workers to be dealt with in the section 5.8

The first technicians are exactly those who are currently being prepared by the "Escola Tecnica Federal", in a joint agreement with the pole. The objective of that agreement was basically the training and formation of Chemists, Electro-technicians, and Mechanics.

Table No. 5.17 gives the figures of the results attained.

(table overleaf)

Table No. 5.17

Courses and Enrolments at the "Escola Tecnica Federal - Bahia"  
(1975-1978)

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Courses		1975	years 1976	1977	1978
Chemistry	a	4	4	4	-
	b	160	160	160	-
Instrumentists	a	2	2	2	2
	b	80	80	80	80
Mechanics	a	4	4	4	-
	b	160	160	160	-
Electro-technicians	a	4	4	4	-
	b	160	160	160	-

Source: Escola Tecnica Federal

a number of groups

b N. of students enrolled in the courses.

These are registration numbers, seeing that only 50% of the total have actually finished the three-year course and gone to look for a job, which could make the problem of supply an on-going one. The outstanding 50% are divided among drop-outs, others who have entered the university and those who simply have finished the course but decided to abandon their careers.

#### b.1 Approval of the Program

Going from the analysis of the courses offered to a list of the posts at the pole, some discrepancies may be found. Some of the posts, which require this complete secondary level instruction (11 years) are not being prepared for by the educational network system. These are posts for which additional training is required besides the formal instruction at the colleges. A roll of these posts include: Maintenance Technicians, Equipment Inspectors and Technicians of Industrial Security.

Here, the enterprises have no option but to prepare their own employees, since these occupations require specific knowledge that can be better provided by their own companies. Nevertheless, this fact poses a heavy burden on the human resources departments of each company. They have to carry out an extra program of preparation of technicians.

The need for these programs of training and creation of the labour force have increased by the fact that both the labour turnover and the trainees who drop out tend to be high in the pole. In a labour market, where there are no problems of supply of good labour, the companies can embark on similar programs of training without extra fear of losing a great percentage of the trainees, but that is not the case at Camacari this means that the preparation and training of a labour force could only be a solution in the long run, since the market can be satisfied in the short term only by a program of intensive and very highly specific short-or medium programs of training. A full scale technician is developed only under an intensive on-the-job training that may last for years. Therefore, we can expect the problems of supply and demand of technicians cannot be solved in the short run but needs at least a period of five years.

#### 5.7.5. Proposed Strategy

In the short term, there is not much to be changed, since at this level, the policies are aiming at satisfying daily needs. In fact a whole range of activities has been undertaken, which has in some way relieved

the pressure from the industrial complex. The problem is more serious when we consider the medium and long-terms strategies. Here, some decisions have to be taken to avoid double efforts in isolated fields or the waste of resources on non-essential issues.

A study must be undertaken to verify the impact of the consumer-end industries to be settled in the pole. By the data already available, the tendencies are for an even stronger pressure on the secondary education rung. In contrast, as we have seen, efforts have been made to found a new university at Camacari. However, the recent installation of CENTEC and the reinforcement of the technological departments at the 'Universidade Federal de Bahia can theoretically fulfill the supply of manpower to Camacari without the need to create another University.

#### 5.7.5 (a) Medium-term strategy

There must be some changes in the strategic policies envisaging the improvement in the supply of professionals and technicians to the pole, as well as in the training facilities.

As for the high level professionals, priorities should be given to (i) the introduction of specific courses at postgraduate levels to attend the particular needs of the NPP, (ii) to the infrastructure of the R & D Institutes to help the industries in the absorption of new technologies and to the development of an independent know-how and (iii) to the development of joint efforts among all the Universities and Institutions in the region to draw a scheme to supply the pole with the required professionals.

As for the technicians, emphasis should be put immediately (i) on the question of a Technical School at Camacari to meet the demands of those technicians for the pole and surrounding towns, (ii) on a plan to improve the secondary schools preparing staff for the area (Local Government) and, (iii) on the development of the companies Personnel

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Departments and Research Units for the mostly highly specified needs not shared with other Units of production.

5.7.5. (b) Long-term Strategy

A long-term strategy must consider, not only the regional but also the national problems of the petrochemical industries. Here, planners should take into consideration all the Institutions that have similar objectives, regardless of their location in Brazil. As petrochemistry is an area with thousands of products and therefore different specialties it would be advisable to have specialised R & D Institutes in those regions where the petrochemical Industry has its poles. There is no use in spending resources in parallel researches. Sao Paulo as the traditional industrial centre has already some advantages in this field.

A coordination of these training activities of all the petrochemical companies and other Institutes at the national level is strongly recommended. So, efforts already made at Centres such as CENPES, CEPED, will not be wasted.

This coordination could be made for all kinds of specialised training, not only for the high level professions. The main advantage of such a policy would be the sharing of training techniques for many specialised jobs such as Maintenance, equipment inspection, control of valves and compressors, heating etc.

It will also relieve an extra burden of work from the shoulders of each company or Institute to plan the contents and execution of the occupations, common to the majority of petrochemical companies, which are the main source of technological research, but need the cooperation of all the Institutions relating to R & D. The idea here is, then, to direct those efforts into the living organisations. It is much more difficult to make all organisations work together than to found scattered Units at different places, but this must be done when resources are scarce.



## 5.3.

## SKILLED WORKERS

Skilled workers are a varied and broad category of any industry. It comprises jobs with completely different contents, which make a common program of training virtually impossible, with many of these specialities trained in short and specific courses, specially by "on-the-job training" programs. The profile taken from the pole indicates that the percentage of these workers at Camacari follows the average pattern of around 40%, found at Abiquim and Setrabes, Researches (See 5.3.1.) The importance of the group, however, is not only derived from that figure of 40% but from the quality of the tasks they have. In effect, the unskilled workers form a similar share of the total workforce, but they perform less skilfull tasks with no strategic functions, compared for instance with processing operators.

Table No. 5.6 indicates that the original network system of education does not prepare those types of workers. The burden of the work falls then on the firms themselves and on private Institutes, especially SENAI. The lack of trained workers coming from the network system of education is explained by the failure of new legislation to be effective in the Brazilian schools. They are intended to give to the school-leavers of the First and Second level of education in specific skills to help them to face the labour market. This reform, however, is only on the paper, because of the absence of specific courses at each level. An analysis of the courses available at Camacari is a clear indicator of this difficulty. Some of these workers, such as Welders and Smiths could have specific teaching at schools since they are common to a variety of industries. The absence of any specific course at Camacari costs additional efforts to the enterprises, since they have to give a whole course, instead of a short program on the peculiarities of each trade in the industry. Effectively, this main task of preparing this type of workers belongs to the local government according to the division of the educational responsibilities among the different levels of the Brazilian

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Government (Chapter six).

As there is no probable solution to this problem at the short run, the firms have to bear the onus of the training of new workers. Fortunately, there are some posts for which supply matches demand due especially to some trades and crafts that are prepared on job-training programmes or on work experience. The declining cycle of the construction industry in the pole, for instance, can release some trades and crafts such as welders to work in other kind of jobs. Taking the SENAI study as a guide, there are five trades and crafts, important for the petrochemical industries, for which there is no regular course at the market:

- Instrumental controls Operators (Inputs, Safety and Pollution control);
- Instrumental Controls Operators (Output, Flows and Stocks Control);
- Fitters;
- Lathe Operators, and
- Welders.

From these five, two (Fitters and Welders) are provided by the local labour market. The real problem, then, is reduced to the operators especially designed for petrochemical industries and to Lathe Operators. Thus the solution to the supply problem of skilled workers does not seem very difficult. In these situations, a little imagination and spirit of initiative from managers could well sort out the arising problems. In effect, when the education system is not able to find a solution, the managerial structure has the obligation to give an answer, if it is possible, using the means offered by the existing system.

A possible solution lies in agreements similar to those made between the pole and the "Universidade Federal da Bahia" and "Escola Técnica Federal" to which we have referred earlier on and designed for higher levels of education. The reasons why this solution has never been applied or discussed are probably related to the non existence of a specific technical school at this level and to the arrival of SENAI at the area

with a theoretical capacity to cover the trades in higher demand. As the majority of this skilled labour could be prepared in courses of less-than one year in duration, an agreement during the last year of this first level between selective local schools, SENAI and the pole could prepare the workers for which there is no supply in the market at the moment.

Notwithstanding the age of 14-15 at which students used to finish the first level of education has a direct influence on these prospective technical courses. In this period a job or a career is not yet a main value for the students. Some families also do not believe that, at this early age, the children should make their career choice with a high danger of embarking on an unsuitable future. After all, education is to provide a broadly based learning for life. Firms also prefer to make agreements at the second level, when, besides educational considerations the students have also got rid of their military obligations.\*

This means that firms should be very careful in defining their strategy and tasks when recruiting their workers after only the first level of education. SENAI which has a national wide experience in this field suggests that the family background of the students (or trainees in the case of any industrial agreement) must be taken into account (Castro, 1974). They have realised that descendants from families of liberal professions or from middle class skilled blue-collar workers very rarely embrace an industrial job willingly or successfully. They finish their courses and instead of getting a job, prefer to pursue their studies further on the way to a University.

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\* Military service is compulsory in Brazil at the age of seventeen for a period of one to two year service in the Armed Forces.

In the long term, the pole has to think of preparing a steady and efficient labour force with on-the-job training programs for the coming years. A skilled worker is shaped at the plant, doing his job, much more than at the college. In this way, we can say that an efficient skilled welder, for instance, requires much more than a one-year basic course. He requires long experience at the specific plant where he has his job.

For the short and medium-term as an urgent therapy, a combination of educational incentives, agreements and on-the-job training programs can provide the pole with the work-force it needs in a relatively short period of time. Given the short duration of these courses and training programs and the evolution of the pole, we can say, in less than five years from the start of its operation if the exact policies were applied.

The above combination of incentives, agreements and on-the-job training programs can be made with an understanding of the already existing Institutions operating in that field such as the Municipal Government, the State Government - SETRABES and Secretary for Education, the Federal Government - Ministry for Education, PIPMO, and independent organisations such as SENAI.

5.9 Conclusion of Chapter Five

### General Conclusion of the Chapter

There is no doubt that the human resources policies are of utmost strategic importance for the consolidation of the industrial complex at Camacari as a pole. The pole ideal requires a strategy based both on the traditional internal elements of a corporate plan for manpower, and on the external factors relating to environment issues.

Notwithstanding the widely accepted tenet that new industrial ventures in underdeveloped regions require a substantial increase in the investment on human resources, especially on training new skills, the firms at Camacari do not seem to have spent very much on this issue. On the contrary, the extra burden on training has fallen on the Government network of education and training, which has failed to respond adequately to the challenge for the reasons set out.

Regardless of whatever controversies there are on the studies of demand and supply of labour for the industrial complex, the supply has been more effective than could have been expected at first glance, especially for the professional level. The capital-intensive nature has played a role in the minimisation of that supply. There are however, some peculiarities in the relationships between the pole and different categories of labour not necessarily related to the demand and supply aspects that deserve our special treatment according to each category of human resources.

While the simpler skillful manual workers have not been a serious problem for the NPP, other categories require an improvement or change in the policies adopted up to now.

In spite of the failure in terms of entrepreneurship up to the present, the NPP does offer several entrepreneurial opportunities, since more and more business chances may arise from a large and integrated petrochemical complex. The problem is basically how to develop a mentality of

entrepreneurship and provide conditions for the appearance of those who may turn business opportunities to realities. To do that the NPP needs to give a high priority to small units that can be settled down-stream of its basic complex. This, however, has not been the case.

The entrepreneurs in particular have not found in the NPP a fertile field for their growth. It has been very difficult to attract potential entrepreneurs due to the nature of the business, and the amount of skills and knowledge it requires. A cross analysis with the composition of leadership of the NPP points to an almost complete absence of the regional entrepreneurs. Even the local capitalist groups which take part appear solely as capital providers and not as entrepreneurs extending the nature of the industrial development in new and original directions.

The down-stream industries which could provide more opportunities for entrepreneurs are developing slowly and in a pattern which again favours outside groups. Here a change of policies is necessary intended to back the small consumer-end companies, based on petrochemical feedstocks by providing them with financial credit and a market orientation, technical corporation, to provide encouragement for those small number of companies already settled in the area (See 5.5.6).

As for the managerial cadre, despite the savings on the number of managers for capital-intensive industries such as petrochemical companies, the firms at the NPP have not applied sufficient financial resources in management development programs. This task is undertaken mainly by the Government.

Management Development courses specialised in petrochemical industries held for the NPP, have come under strong criticism by participants, industries and finally by the Government. However difficult it is to assess the exact amount of resources companies are putting into their development programs, new strategies for the long and medium-terms aiming at integrating the regional resources with the managerial staff of the pole are needed and proposed. The development of regional



management has received an initial blow in the face of the dominance by foreign managers of the biggest department (Production) of the pole companies.

As for the Professionals and Technicians, the picture is not very different from the two previous categories. There have been attempts to overcome the weakness of the market supply with short-term measures. In terms of University leavers, there is no shortage of professionals for the pole; a shortage, however, is felt for some technically qualified operators for which training is not yet offered by the market and the efforts to close that gap are far from the required ones. While the main efforts at Camacari have been to create a new University instead of improving the already existing institutions which are able to meet the market demands.

Considering the development of the petrochemical industries not only in the NPP, but in the whole of Brazil, the most sensible strategy is not simply to increase the output of Engineers, Chemists and the like, but to strengthen the whole Brazilian Research and Development Infrastructure of knowledge in petrochemistry. As the pole is a national strategy, so must be the development of highly professional teams in this field, which must be made with strong regional participation in proportion to the share of the NPP in the national production of petrochemicals. Brazil then will have its own access to both existing and new technologies, and those able to operate them, without having to import both technology and those who can put the industries on stream with a viable future.

What is wrong is the neglect of the corporate development of a total workforce in favour of the foundation of another University. At this particular stage and with the requirements of the down-stream industries which require more technicians than traditional professions we argue for a change in the priorities of the local government in favour of the development and training of these technicians that are now and will be so badly needed at the pole.

Due to the strategic importance of the human resources in the integration of the pole to the regional economy, there would be hardly widespread effects unless the participation of the several categories of manpower, especially the entrepreneurs increases in the NPP. After all true progress is made with local cooperation; it cannot be imposed on a community. If the objectives are regional and social development, it is fully time to change policies to persuade, to listen to, to involve the whole local population in the efforts to consolidate the pole.

CHAPTER SIX

THE LOCAL COMMUNITY



Two new residential areas at Camaçari





Two new residential areas at Camaçari



### 6.1. Introduction

As a small community and primary receiver of the first impact of the pole, Camaçari can be a thermometer of the socio-economic effects of the petrochemical industrial complex. As a government-business venture which has some major objectives, the development of Camaçari is an initial guide to find out the commitment of the Authorities to reach those goals.

It is very common to find in underdeveloped regions, large scale projects which benefit the population living outside the area and have little impact on the local communities. Many hydro-electric dams are clear examples. The Evolution of the business theory (Drucker -1964, Ackoff- 1970 Blake & Mouton - 1969) today backs the hypothesis that the industries have an effective obligation to that population. According to our initial hypothesis, they are responsible at least for the problems they create. If this is valid for industries in general, it is much more for the NPP that is also a government undertaking.

If we look straight into chapter 1, we will remember that the main problems of the NE was shown in comparison with the major social objectives of the pole. So, this chapter should perhaps be dealing with that entire region, but in fact, concentrates on the local community of Camaçari. There are good reasons for this. First of all, the fact that the pole is almost wholly located in the Municipal area of Camaçari; secondly, an analysis of the effects on this core will demonstrate the capacity of the NPP to exert its influence on the whole region, and, thirdly, it is at Camaçari that the main direct and tangible influences of the NPP can be measured.

#### 6.1.1. Physical Location

So far the NPP consists mainly of the basic complex at Camaçari since the down-stream industries are having a slow and late arrival due to the reasons previously discussed in 2.4.5 (a) and 3.9.3. Also, as we have already discussed in 2.2. in the literature on growth pole and on concentration and decentralisation of industry, it is over-ambitious to expect a single industrial pole to have a major impact over a region with more than

1.5 square kilometres. Moreover, there is some evidence that the effects of these poles tend to be concentrated in a small area.

#### 6.1.2. Influence of the Pole

How small is the area of influence of the pole on which we should concentrate is another problem to sort out here. In theory, a single Municipality should not be treated on its own, separate from the notion of conurbation. However, the RMS is hardly a Metropolitan Area in technical sense (see 1.4) and the COPEC area being wholly situated at Camaçari, we are right to limit our analysis to that Municipality only. As a Federal development of that size ought not to have its effects so localised, we hope that by concentrating on the local policies and effects, it will be possible to estimate the NPP capacity to have wider influence on (i) the RMS, (ii) the State of Bahia and (iii) the whole NE. When it is necessary, however, we will also make further comments on those variables that are related to these last three areas.

#### 6.1.3. Tangible effects and accountability

Obviously it is on the Municipality of Camaçari that we can find the most tangible effects to measure the impact of the pole. The industries and services are there, and the Municipality has also taken advantage of infrastructure works such as the communication network system, housing, schools, roads, ports, railways etc. We will attempt to discuss to what extent the NPP has changed the entrepreneurial skills of the community and how far the pole has encouraged those changes. Our analysis will start with these tangible aspects, because the intangible ones are more difficult to measure or observe at first sight. Then we will make comments on policies of centralisation and decentralisation of the pole, on its infrastructure, migration and the functional aspects of the local government, such as housing, education and health. Another important aspect is related to the regional linkages created by the input/output network from the pole, together with the traditional industries and the problems related to the unskilled workers of Camaçari.

Behind these comments lie our assumption that business is accountable to its shareholders and also to many other groups not directly working for them. The NPP or the Basic Complex at Camaçari is undoubtedly accountable to the local community as it had affected the local environment. So this chapter is an extension of the previous one, with the difference that here we are not solely concerned with labour. It includes the whole population of the area which is directly or indirectly affected by the arrival of the petrochemical industries. The unskilled jobs at the pole are insignificant if compared to the number of new-comers to Camaçari, who are only capable of undertaking unskilled jobs.

As the pole was set up as a regional development project with an explicit objective of helping the region, Camaçari is entitled to expect to share in any benefit at least proportionately. We can say, then:

- (i) the pole is directly responsible for any local problems it causes as this is a general responsibility of any undertaking;
- (ii) the pole as a mixed government/business project should be even more concerned than a purely private undertaking that the local as well as the regional population shares in the benefits of the development.

#### 6.2. Centralisation and decentralisation of industries

Taking that one of the basic assumption of the pole concept is to provide an industrial decentralisation at the national level, one may think that a similar decentralisation should be enforced at the regional level as well. If that is the case, the pole has started in a wrong way, since it contributed to an industrial concentration in the RMS, instead of promoting a geographical decentralisation of industries. It could be argued that the RMS was the natural location due to the presence of the oilfields, of the refineries and the city services required by the industries. However, the power of industrial concentration is very high and one must be aware of the tendencies industries have to cluster together (See chapter 3) due to economies of scale. These tendencies are even stronger in petrochemicals than in other industrial sectors.



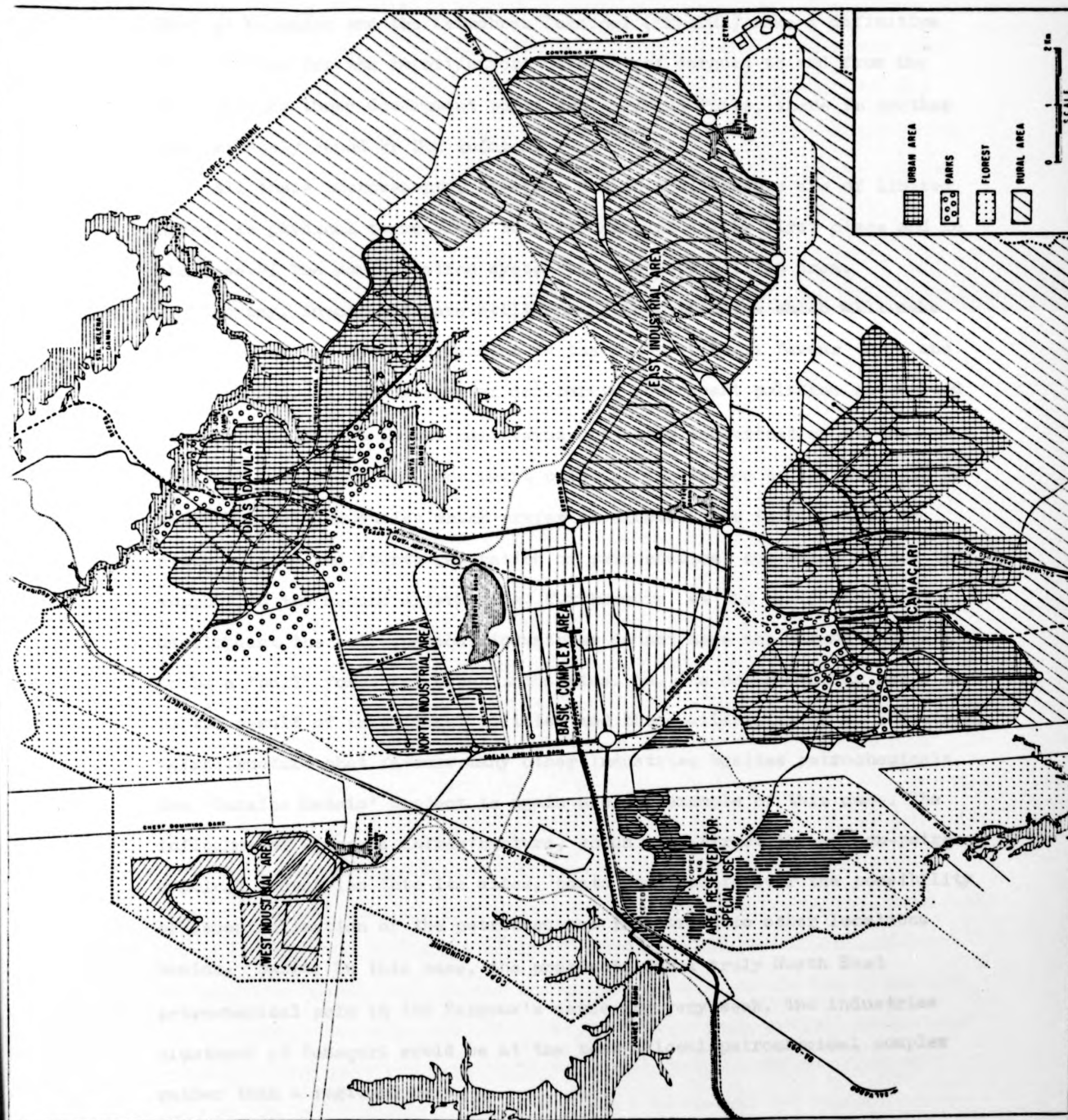
Concentration effects have in fact attracted another group of industries to Camaçari, which have no direct relationship with the petrochemical industries, the so-called "Copper Complex" of Carajás Metals in contrast to the basic complex of petrochemicals. They have been planned to be settled at Camaçari regardless of the copper mines being hundreds of miles away at Sobradinho, which would be the natural location for that kind of industry. Nevertheless, they have been planned to Camaçari under the arguments that among other reasons, that town can offer an excellent infrastructure, but for the petrochemical pole. On the other hand, Sobradinho is a small town at the dry highlands of Bahia which desperately needs new economic activities. The business community of Sobradinho and surroundings have been constantly asking for the reversal of the decision to locate that industry at Camaçari, since it is traditionally settled near the mines due to the economies of transport. Furthermore, Sobradinho has plenty of power and a big reservoir of water coming from the Sobradinho dam, that would get rid of the industrial residues of the industrialised copper, which is of high pollution potential. The single fact that Camaçari was able to attract industrial activities that otherwise would be located elsewhere has proved that, at least, as far as the State of Bahia is concerned, Camaçari has acted as a centralisation instead of decentralisation force. In Hirshman's words, it has more of a backward than a forward effect (Hirshman, 1958).

### 6.3. Infrastructure

One does not have to be an acute observer to realise that Camaçari has changed significantly in these last five years. Apart from the COFEC area built from the scratch, there are quite a lot of modifications inside the new town. New buildings, suburbs, bank branches, schools, roads, bus station, reorganisation of the town life in general, improvement in the communication system, new housing, skyscraper are all pointing out that the present rate of change is very high.

Diagram No. 6/1 gives a rough idea of the improvement in different

Diagram No. 6/1 - The NPP Infrastructure.



(Based on a similar chart by COPEC)

fields such as railways, new ports, telecommunication system and so on. The new Terminal for Liquid Goods at the Aratu Port, together with the main Port at Salvador and the Petrobras Terminal (TECADRE) make a definitive contribution for the import/export movement of cargoes to and from the RMS. Besides these Government built and operated Ports, there is another one privately owned by DOW Quimica.

All these improvements, however, due to their nature are of limited effect in physical terms. They benefit Camaçari in the first place and in the case of the communication system all the Metropolitan Area.

Anyway, investments are still coming into the area which will make the share of the total investment in the State of Bahia favour more and more the RMS. Is this a case of deliberate government policies which lead to decentralisation in national terms but highly concentration at the regional level? Or the government policies frustrated by the strength of petrochemical industries which prefer to cluster? The difficulties to attract third and fourth generation of petrochemical companies do not lend support to the second alternative. Furthermore, at the early stages of development the petrochemical industries do not have the strength necessary to be a 'pull' force for other industries. So, the concentration seems to be the result of intentional policies and the availability of an industrial infrastructure that favours many other industries besides petrochemicals. The 'Caraíba Metais' Project is again a clear example of this case. The influence of Camaçari infrastructure, which can attract these non-petrochemical industries into its sites, casts some doubts over the possibility of decentralisation of the petrochemical industries to other locations besides Bahia. In this case, the prospects for a truly North East petrochemical pole in the Perroux's sense are very weak. The industries clustered at Camaçari would be at the best a local petrochemical complex rather than a regional pole.

#### 6.4. Migration

Even before the implementation of the pole, the process of migration to Camaçari had already started but on a small scale, probably derived from its proximity to Salvador. Several studies have indicated the trend of given populations, notably the migrants from the Reconcavo (roughly the area around the RMS) to move to Salvador. Migration specialists agree that the main reasons behind the movement of people to Salvador are due either to a change of the production system of the agricultural hinterlands or to a stagnation of its economic resources (Singer, 1973, Souza 1977). According to such studies, the migration to the RMS would happen independently of the implementation of industries. The fact that the industries are capital- not labour-intensive is quite independent factor of that migration, which would occur in any case.

Accepting that migration occurs because of imbalances in the economy of the hinterland we have to explain why the migrants are attracted to Camaçari other than to other localities in the RMS. Researches, including one undertaken by the Camaçari Housing Company (DECASA) shew that the expectation of jobs is the main reason behind those who move to Camaçari. The pole, and the level of wages paid to its employees raises the expectation of higher living standards to the migrants than elsewhere. Another research was undertaken on a continuous basis since July-1977 by the 'Secretaria do Trabalho e Bem Estar (SETRABES)' and based on those people who attended at its reception posts (tables n. 6/1, 6/2, 6/3 and 6/4 and Diagram N.6/2).

The data being available only from 1977 onwards coincides with a bigger share of the migration from the places outside the Metropolitan area. It is natural that the first waves of migrants come from their own Metropolitan areas. The reasons are quite simple. They are the first ones to know about the pole; secondly, the firms make their initial recruitment campaign near their own market. In the first years of the building up period, the construction firms hired labour in the RMS and their surroundings, but afterwards, they have to transport labour from as far as

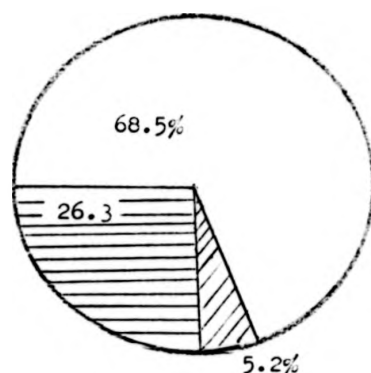
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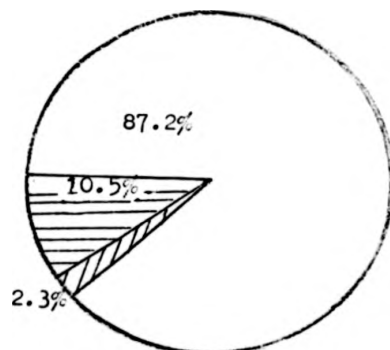
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The data being available only from 1977 onwards coincides with a bigger share of the migration from the places outside the Metropolitan area. It is natural that the first waves of migrants come from their own Metropolitan areas. The reasons are quite simple. They are the first ones to know about the pole; secondly, the firms make their initial recruitment campaign near their own market. In the first years of the building up period, the construction firms hired labour in the RMS and their surroundings, but afterwards, they have to transport labour from as far as

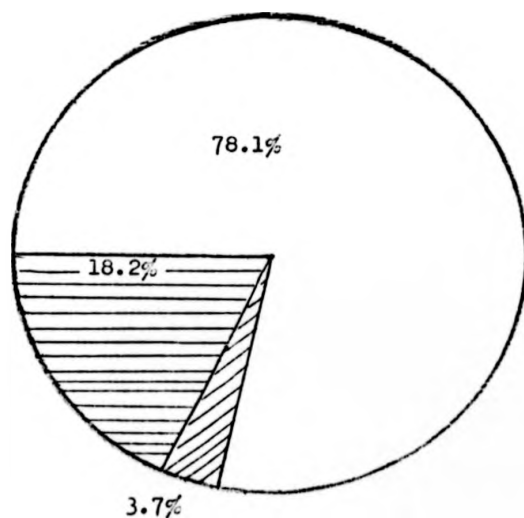
Diagram No. 6/2 - Origins of migrants and low income population to Camaçari  
in the period July-1977 to December 1978.



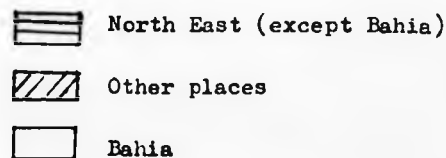
Migrants: 4,973



Low Income: 5,213



Total: 10,186



Source: SETRABES - Projeto Migrantes.

60 miles.

When the migration from more distant areas arrived at Camaçari, the great bulk of jobs had already been filled, which means that the firms were already looking for semi-skilled labour, while the migrants were in their majority peasants without industrial experience. There were some workers without industrial experience. There were, however, some workers with a little experience in the construction industry, which made easier their absorption. They were mainly people coming from 'Paulo Afonso dam' and afterwards 'Sobradinho dam' builders, pointing out, then, the influences of the large scale projects in the training of workers in the NE. This can explain part of the proportion of the workers coming from Pernambuco and Alagoas States. The overwhelming majority of migrants come, however, from other areas at the State of Bahia (Diagram No. 6/2 and table No. 6/4) without that construction or industrial experience.

The immediate managerial problem for the pole is the level of education of the new immigrants now part of the population of Camaçari. The pole continues to be surrounded by a population which came to that site looking for better jobs. In terms of adequate training for an industrial job at the pole, the educational background of that population make this task very difficult. Observe that more than 81% of them had not finished the Primary School (four years Instruction), that is required for any job at the pole. The industries are even becoming more rigorous on this requisite due to the danger of accident in the chemical industries.

The classical question of labour versus capital intensive industries is not adequate here, since the main problem is how to cope with the recently built industrial complex and afterwards what to do to ease the problem of unemployment of unskilled immigrants and also the indigenous population of Camaçari.

The problem is how to absorb new migrants when the old migrants and low income indigenous population are now looking for new jobs. As the



population of Camaçari is more than increasing, soaring in the last few years (Diagram No. 6/6), urgent solution is needed to fill the gap between the growth of its population and the creation of new jobs. At the heart of the problem there is a short term solution that could keep part of that labour force employed at the building sites during the construction period of the industrial complex. The peak of the construction period was in 1977, after which a continuous decrease in the number of jobs began, with the present prospects of further redundancies when the works of 'Caraíba Metais' finish. There are unskilled jobs scattered around different places but not in a number sufficient to rival the influx of migrants. It is at this grey picture that we need to look at the performance of the government-business community at Camaçari. As one of our initial assumptions stated that business is responsible, at least, for the problems it creates, an analysis of the performance of the local government and of the pole is necessary to demonstrate the way the socio-economic problems of the community have been treated.

Table No. 6/1 - Migrants and Low Income Population by Instruction (Period July 77 - December 1978)

Level Of Literacy	Total		Migrants	Low Income
	Abs .	%	%	%
Illiterate	5,051	50.38	49.40	51.29
Unfinished Primary School	8,147	81.27	83.01	80.62
Complete Secondary School	737	7.85	7.44	8.23
Other Courses	64	0.63	0.43	0.82
Total ( * )	10,024	-	-	-

Source: 'SETRABES/ Projeto Migrantes'

( \* ) As these numbers are not mutually exclusive, the sum of the parts do not coincide with the total.



Table No. 6/2 Migrants and Low Income Population by sex and  
Civil Status

(Period July 1977 to December 1978)

Discrimination	T o t a l		Migrants	Low Income
	Abs.	%	%	%
<u>S e x</u>				
Male	6,996	68.7	87.7	50.6
Female	3,190	31.3	12.4	49.4
	10,186	100	100	100
<u>Civil Status</u>				
Single	4,530	44.5	55.9	33.6
Married	3,958	38.9	35.5	42.0
Others	1,198	16.6	8.6	24.4
Total	10,186	100	100	100

Source: SETRADES/Projeto Migrantes.

Table No. 6/3 - Migrants and Low Income Population to  
Camaçari by Age Group.  
(Period July 1977 - Dec. 1978)

AGE GROUP	T o t a l		Migrants %	Low Income Population %
	Abs.	%		
15 - 19	1,628	18.0	18.9	14.0
20 - 24	2,894	28.4	33.6	23.4
25 - 29	1,927	18.9	20.4	18.5
30 - 34	1,153	11.3	11.1	11.6
35 - 39	832	8.2	6.8	10.5
40 - 59	1,384	13.6	8.4	19.5
over 60	160	1.6	0.7	2.4
Not declared				0.1
Total	10,178	100%	100%	100%

Source: SETRABES/Projeto Migrantes.

An ideal and necessary approach to the problems would be the creation of unskilled jobs for the population. Those jobs should have been created at different stages to absorb part of the unemployed labour due to the downturn of the construction industries. The introduction of labour intensive industries would have been a possible solution. Another valid proposal is the creation of jobs at economic activities different from the petrochemical ones, such as in service industries. The efforts to create jobs at that level can be measured by the Government expenditure or investment in projects aiming at creating those jobs. A careful look into the structure of the local government budget will cast some light into the whole matter (See section 6.5).

Apart from those semi- and unskilled migrants, there are the highly paid employees who came to work in the pole but are not considered here for two reasons:

- (i) they are not truly migrants but hired professionals;
- (ii) they do not live at Camaçari, generally, but in Salvador.

If we take migration as an indicator of the pole influence, the data available show in strong terms that its influence on the NE region outside Bahia is very limited. It is restricted to a circle around the RMS and surroundings only. Almost 80% of the migrants come from Bahia and there is no other State with a contribution over 8%. Even if it is argued that migration is not essential for the pole, it implies that the catalyst power of that industrial complex is able to exert its influence only on a radius of few miles only. This in a region where migration has been a constant issue.

Admitting the sociological view that migration is a development factor in the sense that a region is waking up from its sleep to change its structure, to put its population in contact with a different environment (Facó 1978), the contribution of Camaçari to the social development of the region is reduced due to the lack of participation of the migrant force in

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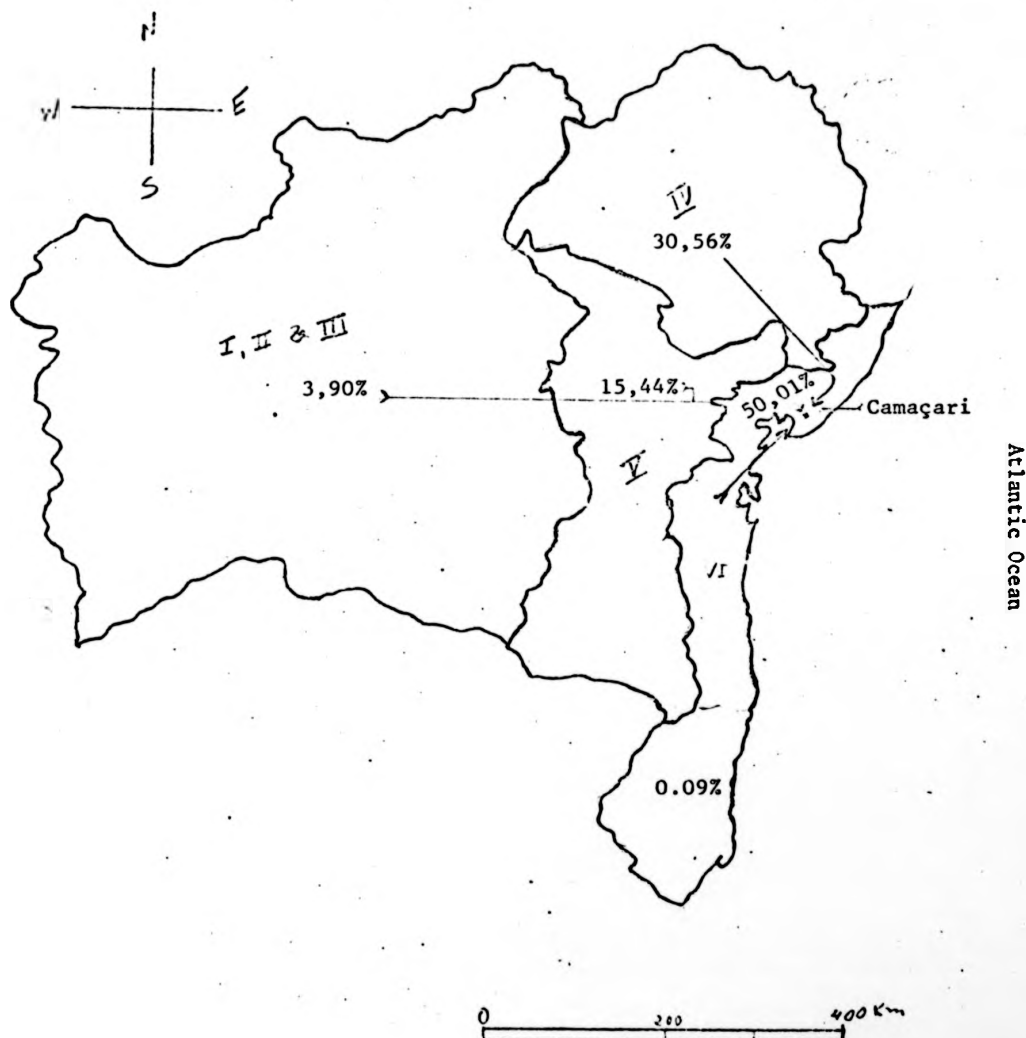
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Diagram No. 6/3 - Origins of the Migrants and Low Income Population from  
Bahia in the Period July 77 - December 1978 (%).



Source: SEIRABES/ Projeto Migrantes.

Table No. 6/4 - Origins of Migrants and Low Income Population  
to Camaçari in the periodo July - 1977 to  
December 1978)

Origin	Total		Migrants %	Low In- come %
	Abs.	%		
Bahia	7,953	78.08	68.54	87.19
Alagoas	218	2.15	3.26	1.08
Ceará	262	2.57	3.66	1.54
Maranhão	43	0.42	0.67	0.19
Paraíba	88	0.87	1.11	0.64
Pernambuco	757	7.43	11.92	4.06
Piauí	189	1.86	3.36	0.43
Rio G. Norte	37	0.36	0.39	0.35
Sergipe	258	2.53	2.84	2.24
North East (except Bahia)	1,852	18.18	26.23	10.52
Rest of Brazil	381	3.74	5.24	2.30
Total	10,186	100.00	100.00	100.00

Source: Setrabes/Projeto Migrantes

the industrial life of the town and to the small radius of its influence.

We can add to these points the fact that the indigereous population has also been kept apart from the development of the pole, since they are not involved in it, we have a gloomy picture of the social influence of the pole on the local community.

#### 6.5. Finance

There are quite a lot of indicators that can be used to verify the financial impact of the pole on the local community. First of all, it is necessary to see if the enterprises are financially healthy to survive, pay the social taxes and be profitable. Without these conditions, there would be a continuous running down into debt of the government which would be obliged to keep on pouring money into those industries. It is of the nature of the business to be profitable, even if this profit is measured in non-quantitative terms.

An assessment of the financial performance of these enterprises at this initial stage of operation has many short comings and is a bit difficult to make. The investments, generally, tend to be very high and the fixed assets tend to have a bigger share in the balance sheet than it would normally have in older firms. These facts put some industries in trouble as far as working capital is concerned. A more important point, however, is the pole capacity for generating revenues. Taking that the investment up to now totals in rough terms US\$ 3.5 billions, what is the contribution in terms of taxes for the local and State governments? This analysis must differentiate between two facts. First of all is the general evolution of taxes from the pole; the second is the growth of the local government budget.

The State of Bahia is divided into ten 'Delegacias Fiscais' (administrative units in charge of the collection of taxes). The pole is under the area of the 'Delegacia Suburbana', which comprises the industrial and suburban area of Salvador, Lauro de Freitas, Camaçari and Simões Filho.

The main characteristic of that Unit according to its Chief Executive ('Delegado') is the size of its tax payers, whose 117 bigger ones represents more than 87% of the total tax collected (Secretaria da Fazenda, 1977).

Table No. 6/5 Projected Evolution of the Collection of ICM by  
year & Delegacia Cr\$ 000s

Years	Delegacias				
	Capital	Suburbana	Ilheus	Others	Total (*)
1977	955	557	359	839	2,710
1978	1,033	930	389	892	3,243
1979	1,116	1,128	418	944	3,602
1980	1,190	1,128	447	997	3,762
1981	1,268	1,846	476	1,049	4,639
1982	1,347	2,016	505	1,102	4,970
The same table in percentages					
1977	35.2	20.6	13.3	30.9	100
1978	31.9	28.7	12.0	27.4	
1979	30.9	31.3	11.6	26.2	
1980	31.6	30.0	11.9	26.5	
1981	27.3	39.8	10.3	22.6	
1982	27.1	40.6	10.2	22.1	

Source: Secretaria da Fazenda/BA - DERE/ST.

(\*) The sum of the columns does not coincide with the total due to approximations.

The share of the 'Delegacia Suburbana' in the collection of ICM is supposed to increase from 20 to 40% in 6 years. Its position in relation to the total State revenue has changed significantly in the last years. From a mere 4% share in 1971, it jumped to 17.2 in 1976 and 21% in 1979, with the



prospects of reaching 25% in the next few years. At the long term, the trend is for the 'Delegacia Suburbana' to provide around 40% of the State revenue, what means that it will put the Delegacias of Salvador (Capital) and of Ilheus well behind (Data from the Secretaria da Fazenda/Bahia).

As far as tax is concerned, the growth of the 'Delegacia Suburbana' is unquestionable. It overtook not only the place of Ilheus and Salvador (Capital), which were heading the tax collection for many years, but also it beat the two main traditional economic areas of Bahia. Ilheus is the cocoa area - a traditional crop of the State - which was the main source of income for Bahia for many years, when it yielded its place to Salvador due to the presence of the oil industry. These two economic activities are definitely put to a second place, with the industrial program assuming the leading role. A forty per cent of the State revenue is a clear indication of the importance of the industrialisation of Bahia.

Let us break that data now to verify the extent to which the petro-chemical industries have contribute in taxes for the 'Delegacia Suburbana'.

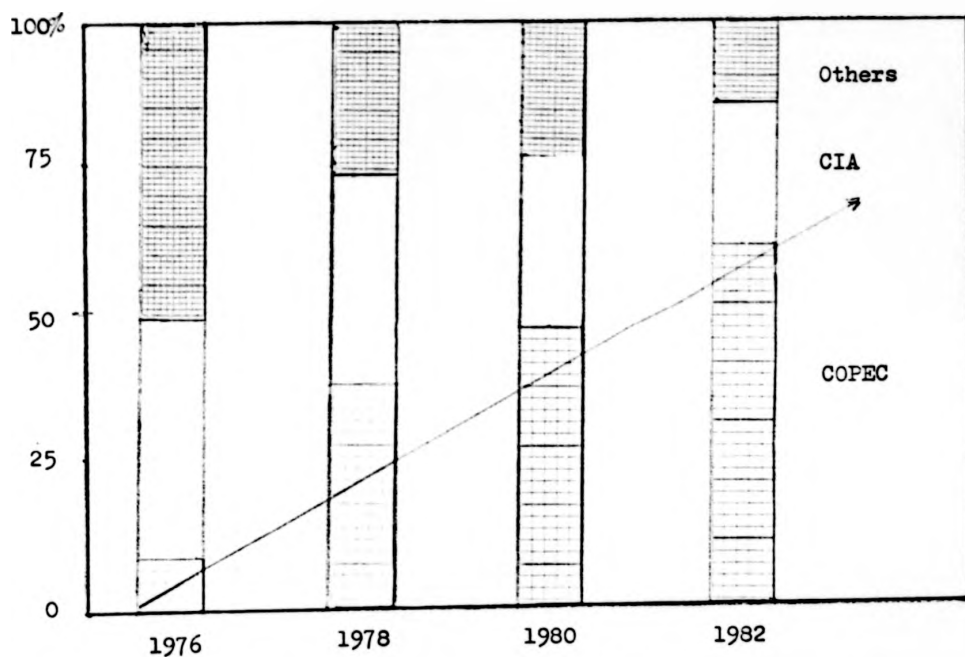
Table No. 6/6 - Collection of taxes (ICM) at the 'Delegacia Suburbana' by source and year.

year	Total * (Abs.)	CIA %	COFEC %	OTHERS %	TOTAL %
1976	398,465	40.3	9.0	50.7	100
1978	929,528	36.2	37.8	26.0	
1980	1,228,065	29.9	47.8	22.3	
1982	2,016,107	24.5	61.9	13.6	

Source: Secretaria da Fazenda/BA - Delegacia Suburbana.

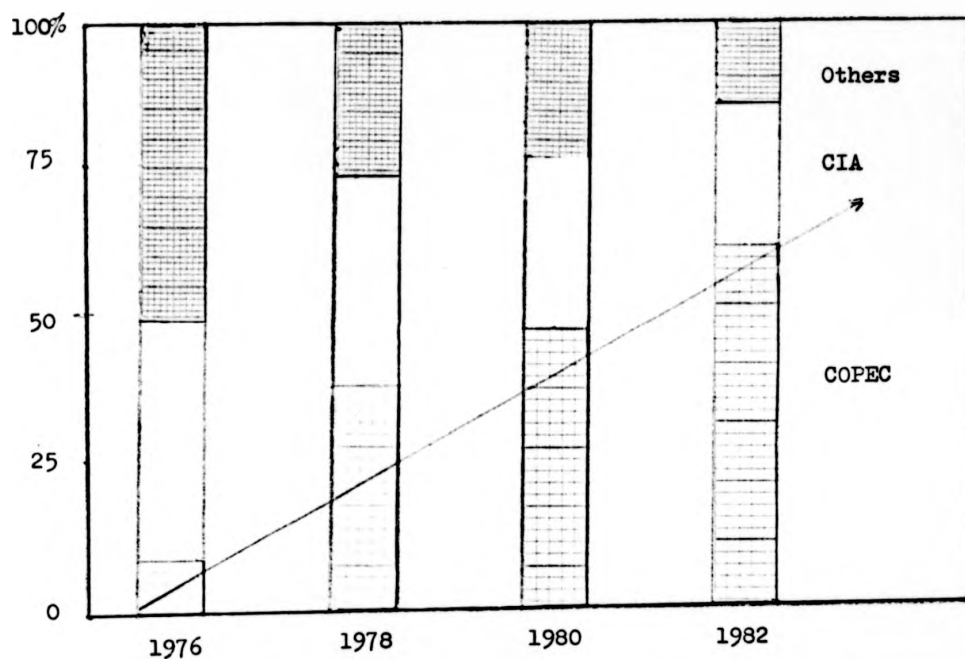
The share of the pole in the total revenue of the 'Delegacia Suburbana' is increasing steadily. That share is even higher than it is

Diagram No. 6/4 - Collection of ICM at the 'Delegacia Suburbana' by source in 1976, 1978 and projections for 1980 and 1982. (Percentages).



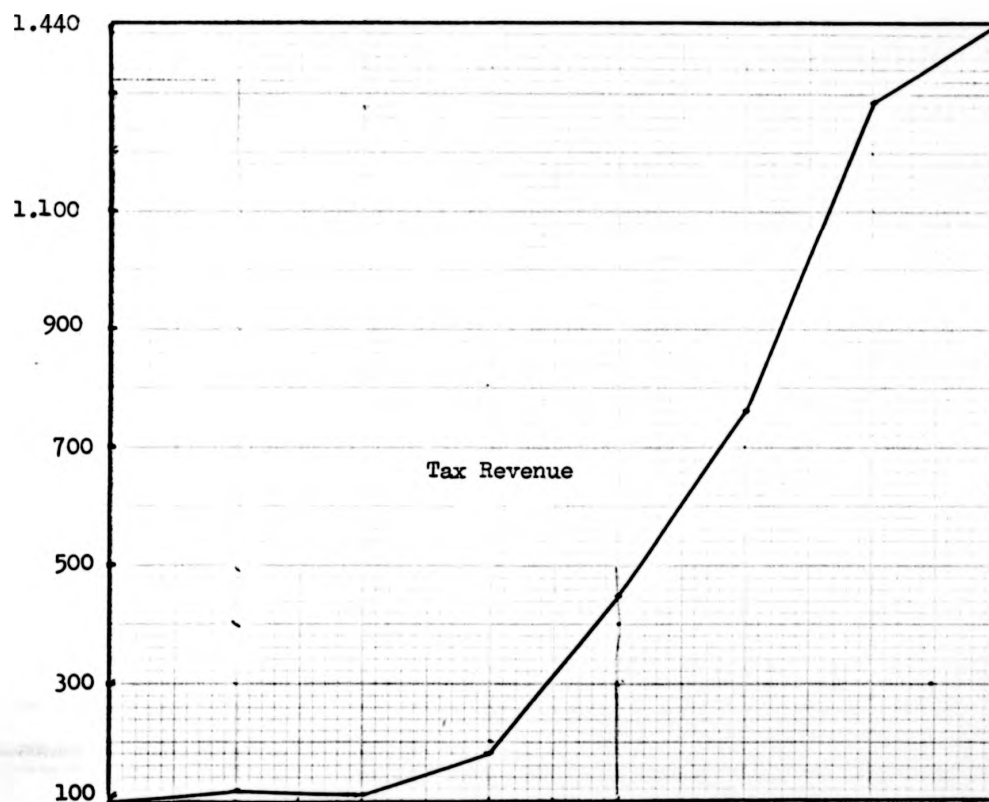
Source: Secretaria da Fazenda/Bahia, Delegacia Suburbana

Diagram No. 6/4 - Collection of ICM at the 'Delegacia Suburbana' by source in 1976, 1978 and projections for 1980 and 1982. (Percentages).



Source: Secretaria da Fazenda/Bahia, Delegacia Suburbana

Diagram No. 6/5 - Evolution of Camacari Tax Revenue  
(1971 = 100 )



Source: Local Government.

Data are deflated.

shown in table No. 6/3 and diagram No. 6/4, since many petrochemical companies are geographically in the CIA area and not in the COPEC, reason why their tax contributions are allocated to the first column in that table.

The first conclusion is that the advent of the pole has made fundamental changes in the tax structure of Bahia. The fast growth of the 'Delegacia Suburbana' indicates that at least in financial terms the area where that Unit is located, especially the Municipality of Camaçari has climbed many rungs in the city hierarchy in Bahia. An immediate conclusion of this change is that an arm of the export-import scale is leaning fast towards the manufactured goods. If this trend goes on, the State of Bahia will change from an exporter of agricultural commodities such as cocoa to manufactured products processed at the pole.

In effect, the ICM, a tax on the movement of goods, similar to the British VAT, collected at the pole, will total the amount of US\$ 800 millions by 1982. The ICM represents more than two thirds of the State revenue and the pole would be the main source of that tax in the near future. A series of criticisms made on this industrial adventure identifying it as a quixotesque adventure or a pharaonic enterprise is a non-sense. The pole has proved that it generates dividends for the State of Bahia. It pays off.

Admitting that these data are sufficient to prove the impact of the pole on the State revenues and thus on the investment capacity of the public sector after the full operation of the pole, other crucial problems remain to be solved. The increase in the revenues will mainly benefit the State of Bahia and the Municipality of Camaçari. Very little is left, then, for the rest of the North East region.

The following point is to see how this growth in taxation has affected the Municipality of Camaçari. This can be partially explained by

the mechanics of the distribution of the ICM, that is collected by the State and divided between itself and the Municipalities. When there are government incentives, as it is the case at Camaçari, the share of the State is equally divided between the State and the 'DESENBANCO' (The State of Bahia Development Bank), which takes half of the percentage allocated to the State and hands it out back to the firms. The proportions are, then, as following:

State	-	82%	-	50% to the Treasury,
				50% to 'DESENBANCO'
Municipalities	-	18%		

In rough terms, we can say that the growth of Camaçari revenues (table n. 6/6 and 6/7) will go step by step with the increase in the ICM of the 'Delegacia Suburbana' with two basic differences: (i) the Municipality has other sources of revenues and (ii) some petrochemical firms are outside the fiscal area of Camaçari, what means that other Metropolitan Municipalities are having some advantages from the installation of the pole.

These figures put Camaçari in a singular position. It is not the largest town in Bahia, but has now one of the biggest budgets. This is not an insignificant evolution. There is a clear indication that the pole has also affected the budget of the surrounding Municipalities of Simões Filho and Candeias.

These revenues have allowed Camaçari a substantial increase in its investment plans that, if well managed, can change all aspects of the human life of the town. The nature of this change is closely related to the Government expenditure program. How is Camaçari spending its resources?

#### 6.6. Local Government

What are the priorities of the local Government expenditure? Our initial analysis is based on the past government expenditure programs and on the priorities as expressed by Camaçari plans. Apart from expenses with Administration and Planning, where the wages of the Civil Service are

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Table No. 6/7 - Total Revenue, Tax Revenue (Prices of 1971)  
and Evolution of the Tax Revenue (1971 =100)

Years	Total Revenue ( 000's)	Tax Revenue (Prices -1971)	Evolution of the Tax Re- venue
1971	2,000	1,618	100
1972	2,610	1,876	116
1973	3,121	1,834	113
1974	9,471	3,016	186
1975	35,923	5,765	356
1976	104,166	12,415	767
1977	170,524	20,354	1,289
1978	250,000	30,000	1,438

Source: Local Government of Camacari



Table N. 6/8 - Source of Camacari Revenue in the period 1972/1978.

(Percentages)

Source	1972	1974	1976	1978
IPT - Tax on Urban and Rural Property	4.9	9.4	1.5	3.4
ISS - Tax on Services	27.0	19.8	21.3	23.2
Other revenues from taxes	4.3	4.7	1.9	2.6
ICM - Tax on the Movement of Goods	34.5	41.1	11.1	18.4
FPM - Fund of the Municipalities	17.8	12.7	2.0	2.4
FRN - Fund from Taxes on Vehicles	2.8	1.3	0.1	0.2
Others	8.7	11.0	2.9	24.3
Credit Operations			40.6	25.5
Federal Government Aid			18.6	-
Totals	100%	100%	100%	100%
	Abs. Numbers (Cr\$ m)	6,521	103,616	250,000

Source: Local Government of Camacari.

included (table n. 6/9), the areas where the Government have spent more are 'Transport' and 'Housing' and Urbanism' (physical town planning - roads, water etc. ). Education and Health come well behind, despite having increased substantially, having grown over 4,000% and 2,700% respectively. Social Security came from 100 in 1975 to 10,306 in 1977. These values have grown faster than the population but their exact dimension should be seen in the light of the sectors of society which were effectively applied to. The following headings are an attempt to understand the socio-economic policies of the local community as a consequence of the industrial development. As the higher burden of this work is under the responsibility of the Municipality of Camaçari, our analysis basically relies upon the performance of that local government.

Table No. 6/9 - Functions of Local Government Expenditure - Evolution  
in percentages - 1973 = 100.

Functional Areas	Y e a r s				
	1973	1974	1975	1976	1977
Adm & Planning	100	193	879	1411	4370
Communications	100	-	108	39	-
Defense & P. Security	100	-	-	522	3910
Education	100	130	288	2745	4082
Housing & Urbanism	100	639	2717	4674	7101
Health	100	169	385	900	2731
Labour	-	-	-	-	400
Social Security	100	493	937	4866	10306
Transport	100	281	516	39	17581
Reg. Development	-	-	-	100	406
Total	100	305	1048	2509	10292

Source: Local Government of Camaçari.

### 6.6.1. Local Government : Social Security

A study jointly undertaken by the 'Secretaria de Minas e Energia' and the Local Government of Camaçari has defined three areas of action in Social Security policies:

- ( i ) to guide and to prepare the migrants arriving at Camaçari;
- ( ii) to control the emergence of socially sub-standard areas (shanty-towns or 'favelas') and
- (iii) to assure a larger participation in the benefits of the petrochemical complex to the local population.

Some instruments were available for the attainment of those objectives.

The main ones were:

- The Land Use Act which establishes the whole land referring to the COPEC area (Diagram No. 1/6) as of public interest, which means that the Government has the right to expropriate land when it is in the interest of the general public and
- the new financial resources that would be available and directed to those functions.

The study proposed that the policies should be under the responsibility of a Committee where participants of both business and Government Community should have their seats. The same should be said about the financial resources.

A small glance at the performance of the Municipality Secretariat for Social Security shews that some actions in that direction have been taken. They were deeply involved in the process of reurbanization and improvement of some ramshackle areas of the old poor of Camaçari and has developed some new efforts to guide the settlements of the newcoming population, through two schemes called 'PHOC' (Project of Guided Housing of Camaçari) and 'CURA' (Project of Urbanisation and Recuperation of Areas).

The philosophy behind those projects is a distinguished feature at Camaçari today. The Land Use Act has allowed the Municipality to organise to a limited extent the new settlements avoiding the appalling shanty-towns

so common in Brazilian cities. The PHOC is essentially a limited attempt to guide the new settlements in such a way that their future development can be promoted, controlled and monitored. The scheme is the simplest possible. The Municipality designated some areas for new development and promotes the first signs of urbanisation, such as the delimitation of streets and the division of land for new homes. The divided land comprises 10 m x 20m long, measuring 200 m<sup>2</sup>. The new owners receive the land and are obliged to build their homes regardless of the material used for that purpose, in a certain period of time. The Municipality has also a plan to give orientation and instruction to the new owners on how to build their houses and what kind of material to use. And also they are advised that they cannot sub-let the new property or build more than one house in each piece of land. Six new settlements have been already planned and their occupation is virtually finished. The land is sold at cost price with pre-fixed monetary adjustments in very long installments and the urbanisation consists of, at least, street kerb, electricity, collective sewage (one for each group of four houses) and social 'nuclei' with areas for school and professional training and leisure, and a fountain with public laundry.

As the average income of this group is very low, they do not pay interest on overdue instalments and those who need have a year of repayment holiday.

The 'CURA' are projects of different nature but with a very similar philosophy. The objectives are the correction of old suburbs or of the initial unorganised settlements to give them an urban structure. The customers are generally people who have already been living at Camaçari before the implementation of the industrial pole and whose level of income is not high enough to buy a quality home. In bare words, the 'CURA' projects are a kind of conversion of 'shanti-town' areas into something similar to a reurbanised area. The Municipality intended, then, to give some assistance to those areas and some orientation about the availability of new jobs for the population. It is a remote integration of them with the new economic activity settled at

### Camaçari.

There are some arguments going on regarding these projects as the legalisation of disguised 'favelas'. In fact, nobody can say that the PHOC and CURA projects provide homes suitable to attend the minimum requirements as defined by the UN housing studies. Nor can the areas be said to be fully urbanised. Against them, there are the facts that the newcomers did not always have jobs or even could afford to build those appalling houses. Other times, they lack the incentives to do it or the ability to build.

The projects, however, went ahead and, at least, do not resemble the formless pile of homes one may see at the 'favelas'. Compared with those 'shanti-towns' at Salvador, for instance, the PHOCs and PURAs are suburbs of advanced stage of urbanisation, at this stage. They need, however, continuous assistance not to be converted in 'favelas' of the same type. Unfortunately, the money that is allocated for this purpose is not sufficient and the future of this projects looks very gloomy indeed.

The other point is that many newcomers to those houses are homeless people who have lost their properties for the allocation of the COPEC. If those people were better educated, or had a better standard of living, they might well have fought for better prices for their properties. However, many of them are so resigned to their fate that even when the Social Service people went to visit them to verify if they were willing to move out, they have shown disapproval to what appeared almost to be expropriation, but refused to fight against it. I was told by several of the people whom I interviewed that they were deeply touched by this attitude which they were unable to change. Those removed people, of course, were not rewarded for their resignation as, generally, nobody benefits from the ignorance of one's rights. But on the other hand, there is no excuse for a public corporation not to pay to the poor, what they should have certainly paid to a millionaire if he was the owner of the disappropriated area.

Another criticism is from the planning aspect. As Camaçari is not an island, its planning efforts alone would not produce a great impact in the area if they are not in conjunction with the other municipalities of the RMS. One point is that not much greater assistance should be provided for one area only. Otherwise, it would attract much more people making a continuous assistance virtually impossible. Moreover, the basic question is not the provision of homes, but jobs. Some sociologic studies have shown that the extremely poor, who have not got a job, find it easier to live in the centre of big cities than at its outskirts, due to a number of facilities available at the centre. At Camaçari, the lack of unskilled jobs and the high prices of land combine together to make the life of the poor more difficult than it was before the planning of the pole.

The other activities of the SEDES are the traditional ones that can be found at any organisation of that kind. They consist of sections devoted to the integration, social orientation of the community and its social Institutes.

The development of these functions at Camaçari was also restricted by the limited area on which the Municipality can operate. When the pole is very widespread and the planning of the social services are restricted to the core region, it is clear that the more remote areas will suffer from the absence of those services. That is a problem that emerges in virtually all the fields of planning at Camaçari.

Chapter Four has studied the planning structure of the pole and specified some disfunctionalities that could be derived from it. At this particular point, there is no way to an effective planning of the social structure and to the provision of social services to the pole, if the bigger burden of those responsibilities is left to just one Municipality, while the employees of the pole are spread over the whole metropolitan area. Even when we put the highly paid employees apart, considering only those who do not have the skills required to get a specialised job at the pole, we arrive at the point where the assistance should be limited, provided it is restricted

to a particular area. Looking at the diagram n. 6/3 and table n. 6/4, together with the overall population growth of the RMS, we know that other Metropolitan Municipalities are becoming net migration receiving areas (Souza, 1978 ). As the Municipality of Simões Filho, close to Camaçari, has another planned industrial district (CIA), efforts to develop the area should be brought together under the same coordination for a unitary approach to the huge problems of industrialisation of Bahia.

That global approach should take into account the peculiarities of Camaçari as a small town where there is a process of social mobility, caused by a wave of new residents who come to share the town with the old population. In that situation, there is a process of social adjustments that could last for a period long enough for the place to receive and integrate the newcomers.

There is the danger that the rising expectations of this new population is not fulfilled, in which case a process of readaptation to the new situation is necessary. Fortunately, these expectations at Camaçari seem to be at least partially attained.

A research by the Municipality & Decasa (DECASA 1977) have shown that more than two thirds of that new population consider their new status as better than the previous one. In the same way, the old population see that the town is changing for better. This apparent satisfaction fails to take into account the fact that new waves of migrants always bring social frictions in many areas that are essential for a socially healthy urban life. New migrants change the balance of education, health, social interaction, sex and age, since the majority of migrants tends to be youngsters and males. The work of any Department devoted to social integration is, then, doubled. Besides, the normal problems of integration in any community, there are others derived from these newcomers (DECASA, 1977 ). Many old residents, for instance, had to change their homes and could not find new houses due to the high prices for renting. Prices at Camaçari and surroundings have

jumped several fold. This implies a double attack on that population: unemployment and homelessness.

#### 6.6.2. Local Government: Housing

...e strongly resist the view that the provision of homes is a paternalistic attitude in terms of business. It could be so in a completely different environment, but not in a planned industrial complex, where, besides the development of the business itself, it is necessary the construction of the urban infrastructure. It works against the development of the business to have an industrial site, surrounded by housing unsuitable for labour, where the workers have necessarily to come from other areas.

As far as housing is concerned, Camaçari has already a big problem. It is becoming a worker suburb due to the unwillingness of high income technicians and professionals to living outside Salvador (See 6.4 (i) and (ii) ). A long term project by the Authorities could probably convince some of those well paid employees to live at Camaçari. The fact is that the pole has put a housing pressure on the market in Salvador with the predictable increase in land prices that is already one of the highest in Brazil nowadays, notwithstanding Salvador being a Capital of a State in a poor region of the country.

The DECASA and Local Government research has put the housing deficit at Camaçari around 8,000 units in 1978, not including those already settled at the 'PHOCs' and 'CURAS' projects. That high deficit in a small town put an effectively high pressure on land prices, primarily on the rent sector. This has even encouraged house owners at the town to move out of it to rent their homes. In 1970, 75% of the dwellings at Camaçari were owner occupied with only 12% rented. That explains the relatively independent nature of the town. With the arrival of the pole, it creates a deficit of over 12,000 units according to the Local Government. That is the reason why some technicians dare to say that the solution to the housing problem at Camaçari consists of building another town.

In industrial terms, there are two options to be adopted. Either the



pole decides to subsidise the costs of transport for its work force to and from Salvador and other surroundings towns for an indefinite period of time, or it can join the efforts to encourage its employees to live nearby. The approximate subsidies for transport given by the industries at Camaçari are around US\$ 800 thousand yearly, according to the 'Secretaria de Minas e Energia'. Part of those subsidies to transport could well be devoted to the encouragement of employee to buy new homes at short distances from the industrial site.

The hard facts behind the housing policies at Camaçari are that the spread of slums inside the town with its social consequences does not benefit any major partner in the pole. A socially healthy atmosphere is necessary to allow the permanence of the employees at the locality and promote an environment able to favour the development of the skills required by the industries. Therefore, industries and government have to work on a scheme to improve the housing condition at Camaçari. Housing subsidies for the pole employees are an open and suitable way for it.

#### 6.6.3. Local Government: Education

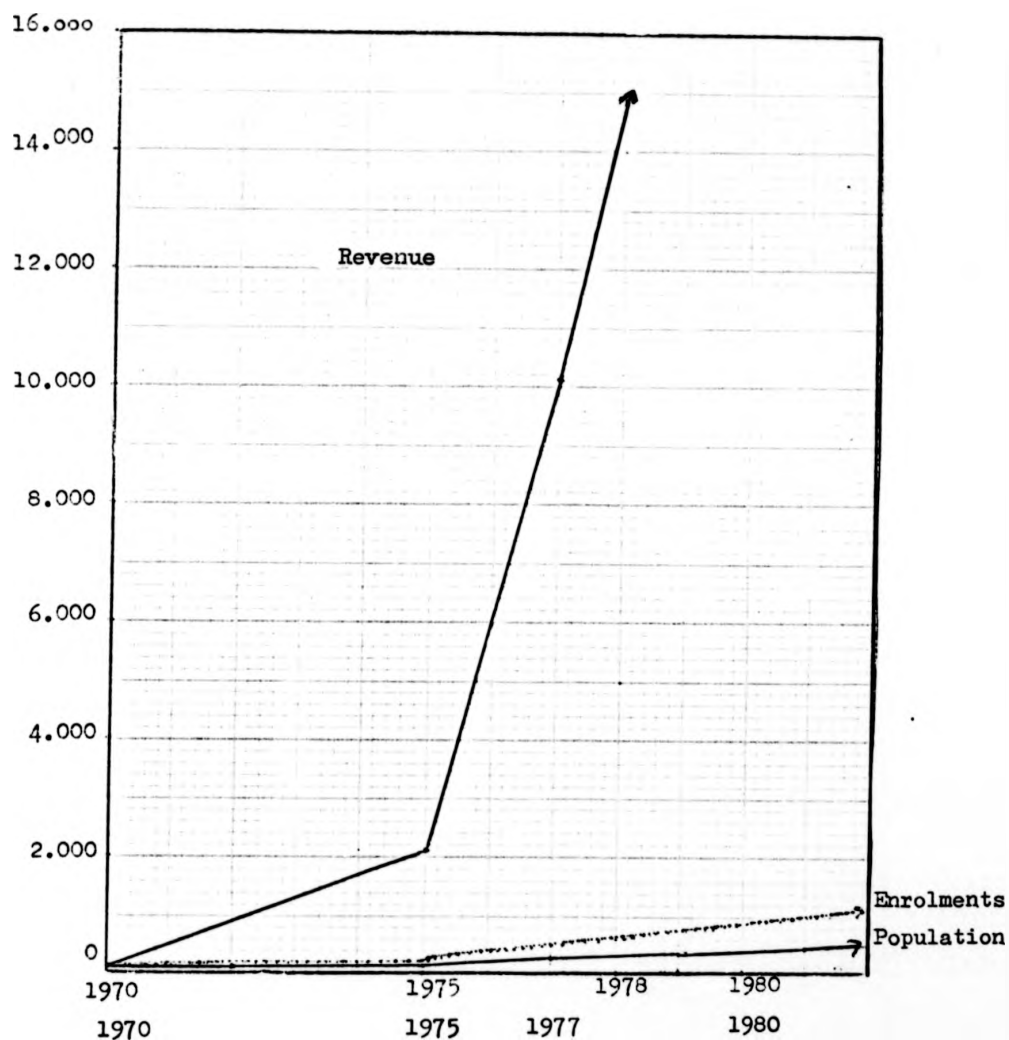
There is no better sector to understand the policies of a Government than education. It reflects the main philosophy behind the Executive power. It is also an indicator of the level and standard of development of a community.

The analysis on migration has pointed out the low standard of the migrants who arrive at Camaçari. The majority of them (81.3%) belong to those without a primary education, being also youngsters in general. It is immediately expected that the priority of the local government education policies would be that group.

Table N.6/10 gives the behaviour of the enrolments at the first and second level of education at Camaçari, since 1970. The third level is not included because there is no University Institute at the locality.

Diagram No. 6/6 - Population Growth, Local Government Revenue  
and Enrolments at Camacari. Index Numbers.  
1970 = 100

(Data are not corrected for inflation)



Source: FIBGE - Anuario Estatístico do Brasil

Local Government - Revenue

DECASA (Projections of Population)

As far as the construction of new schools is concerned, the local government has built a dozen new schools comprising approximately 80 school-rooms for primary education (8 first years) and has improved other schools for the second level. Compared with the increase in population, the increase in enrolments and the construction of schools is very short of meeting the actual demand (see Chapter 6/7). Here is the crunch of the problem. Camaçari suffers from the low quality of its migration in a labour market that requires a relatively high level of skills. How, then can the meagre resources for the basic education be justified? If the government put money into industrial projects, it should also invest on its social infrastructure. Moreover, the single fact that Camaçari is receiving great contingents of migrants requires even greater investment in education (\*).

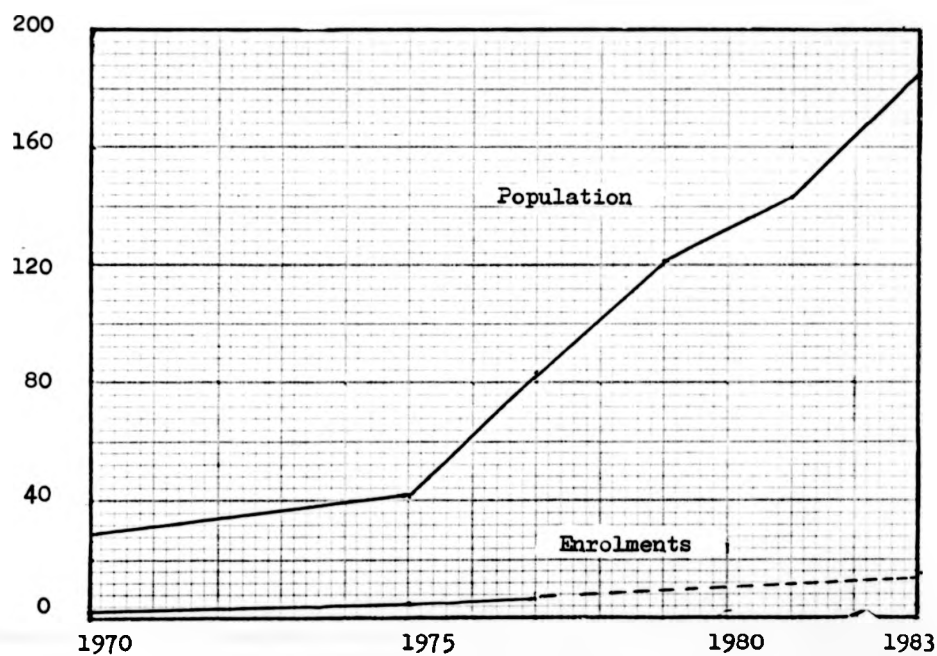
The other major institution at Camaçari is the SENAI, a private organisation backed by industries, devoted to training of specific skills. It is building a school at the COPEC area, but its courses have been given at the old centre in Salvador and also in on the job training programs. The local government has very little involvement on this matter. More realistically, its presence on industrial training is virtually nil. Both the private and public sector have been very slow to look for the right solution to the problem. It is well known fact that the local industries are nowadays recruiting some of their employees in the South East. If there's no alteration in the policies adopted in this sector, it is likely that these difficulties of recruitment for certain jobs will last longer, with the derived social and economic effects. And more serious yet is the fact that a retraction in the training of the basic skills can make the

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(\*) It is understood that migration, by being composed mainly of youngsters, singles and young couples, brings a group with high needs of education.

Diagram No. 6/7 - Population and Enrolments at Camacari

(Abs. Numbers in 000's )



Source: Local Government/Secretaria de Educação

DECASA - Projection of Population Growth.

development of satellite industries even more difficult. However, some jobs of difficult recruitment in the pole are among those which require only the first and/or the second level of education, which should deserve more attention from the public authorities.

Unfortunately, Camaçari is making that same mistake very common in underdeveloped countries. Instead of preparing the solid foundations of the education building, they preferred to start by the roof, that is, the insistence on the University project is detracting importance from the first and more emphatically the second level of education.

Table 6/0 Enrolments at Camaçari

Years	First Level	Second Level	Other Sources	Total	
				Abs,	%
1970	3,873	80	-	3,953	100
1971	4,798	80	-	4,878	123
1972	5,767	168	-	5,935	150
1973	6,115	179	-	6,294	159
1974	7,019	200	-	7,219	183
1975	7,781	530	609	8,920	210
1976	8,796	736	1,559	11,091	241
1977	10,025	680	2,467	13,192	271

Source: IBGE (1970/74 and Delegacia Escolar

PMC - COEN - 1975/1977.

#### 6.6.4. Ecology and Environmental Protection

Any major chemical complex immediately raises the question of pollution, environment protection and the like. The official response at Camaçari is that all measures required for these issues were already being taken right from the beginning, such as the building of a central plant to treat,

liquid effluents from the pole, a plantation of a new 600 ha forest to protect Camaçari and its village Dias D'Avila and lagoons for the chemical residues. Furthermore, every single industry to be installed had to get a government licence with the assurance that its equipment will not pollute the environment.

In practice, however, some problems have appeared. First of all, the main task has been to get more industries rather than to select the few prospective companies; secondly, the government body responsible for the provision of anti-pollution licence is also responsible for the enforcement of the law; third, it lacks the appropriate equipment and trained staff in sufficient number to undertake that function.

The proceedings are very simple. The industries have to present a description of the equipment to be used for an examination by the CEPED, which gives a preliminary certificate for a provisional installation. The problem is, accorded to high ranked officials at that centre, that the Institute is not able to verify whether the industries comply with the requirements prescribed in that preliminary certificate. Moreover, as the difficulties of attracting industries to the pole are very high, it is very unlikely that any local Authority would take the risk of losing an industry due to ecological arguments. The short life of the pole has already proved the danger of pollution. Just on the first day that COPENE put its Central of Raw Materials on stream to test its mechanisms, the effluents killed several tons of fish in the River Jacuipe which meant that river was definitely condemned to death. All the fishermen who have in the fishing waters of Jacui e their basic economic activities were unexpectedly out of work.

It was suggested that another Federal agency would find a suitable solution probably by retraining those fishermen for sea fishing.

Complaints about pollution are becoming more and more frequent. Doctors have identified the growth of respiratory diseases in the area, the population of the spa resort in Dias d'Avila is complaining about strong chemical smell; technicians of the water supplier company are worried about the concentration of ammonia in some fields and also on the possibility of the contamination of the water table from which drinking water is obtained.

There is also the possibility that the effluents from the pole go to pollute the north beaches, what is already the case with beaches in Salvador, damaging again another industry of major significance in Bahia. It would be certainly a great mistake to build the pole in such a way that it comes to turn down the quality of life of the population by the restriction of its leisure area, besides affecting negatively the development of the tourist industry. It seems that the pursuit of financial profits and results is moving the pole away from the main tasks of modern organisation - its responsiveness to the needs of society.

#### 6.7. Regional Linkages

One of the main findings of this work is the dependence of the pole on its ability to establish a solid network linkage in order to exert a major influence on the region. Without this network, there is no pole in the truly Perrouxian sense.

The diagram n.2.3. shows possible outlets for that network that would have its main arms on the arrival of petrochemical transformation industries of the third and fourth generation. The linkages can also be expressed in up-stream industries to provide the inputs for the pole, or even a solid support for it. As far as the inputs are concerned, we have:

Table 6.11. Source of raw materials - (% over the value of goods)

Years	Local	Rest of Brazil	Imports	Total
1977	47,59	15,56	36,85	100%
1978	64,37	17,03	18,60	
1979	82,52	8,79	8,69	
1980	80,00	8,95	4,05	
1981	76,32	13,48	10,20	
1982	77,40	13,77	8,83	

Source: Astec/SME

Apart from a decrease in the period 1980/81, the share of the local suppliers tends to grow. At one point, there was the question of the capacity of the Petrobras to supply raw materials over a long period, due to the shortage of oil in Brazil. The question is irrelevant due to the availability of natural gas in sufficient quantities, that would otherwise be wasted. Another main source of raw material is in the North East State of Alagoas, (section 1.2.2.) which improves even more the regional participation as the main supplier of the petrochemical inputs.

The data for the outputs, however, do not show such optimistic view. The original plan fed the hope that up to 30% of the total production could be processed at the region. Actually, less than 10% of the output is being processed here, which means that the down-stream linkages are seriously lacking. This fact by itself is sufficient to deny the industries at Camaçari the concept of Pole in Perroux's sense. They do not satisfy the conditions established at Section 2.2. The so-called pole is, then, reduced to a mere enclave for the production of raw materials for other regions. In economic terms, Bahia would be in a situation very similar to its earlier one, becoming an exporter of semi-manufactured goods instead of a producer of



agricultural commodities, but not of finished goods. The notion of pole implies the development of the transformation industries for its products. There is another indicator which points out an improvement in the local purchases of the industrial products, but does not reveal the nature of the customers. Local purchases of the petrochemical products are supposed to increase from 13% in 1977 to 28% in 1982, meanwhile other states would buy only 70% in 1982 against 87% in 1977. The participation of exports outside Brazil is very low. These facts confirm our assumptions that there should be additional efforts to create new satellite industries around the pole for it to attain its initial objectives.

A slight improvement in the balance of payment of the State or even in the regional GNP would not be sufficient to fulfil the initial goals of industrial decentralisation, creation of an industrial pole, or even changes in the regional structure of labour. All these objectives are essentially bound to the development of the transformation industries.

The analysis of the government-business performance at Camaçari leads us to a sad conclusion that the pole, however beneficial to the State of Bahia as a whole, was built at the expense of the local population. Many of them were removed from their expropriated homes and, finally, were obliged to cope with a successive jumps in the cost of living and prices, without being able to find jobs at the industrial complexes.

Even, the argument that the second generation of the indigenous population of Camaçari will pick up the fruits of the present suffering of his parents is very controversial. Up-to-now, at least, that population has been an outside observer and wasn't considered at any major decision at Camaçari. There is no indication that a miracle will occur by which the descendents of an underprivileged group could be turned into a net receiver of the benefits of the pole.

#### 6.8. TRADITIONAL INDUSTRIAL & UNSKILLED JOBS

Camaçari was for some time a centre of ceramics and also had incipient agricultural and extractive primary activities, which have continued, but without a growth that could rival the pole. The ceramics industries have even gone into serious economic problems recently. Some of them have closed down.

The present demand for civil and industrial building can allow a steady development of the construction and civil engineering industry which will absorb part of the contingent of the unskilled workers at the town in the next few years. The construction industry being the main source for unskilled jobs, there should be a plan to reallocate those workers who are made redundant when the works of construction of the main units finish.

Other sources of unskilled jobs such as cleaners, sweepers are not sufficient to absorb the enormous contingent of unskilled migration. At present, besides some work at the COPEC area, and at the "Caraiba Project" a fast building-up of homes has made work for an additional number of people. Due to the growth of Camaçari and of the RMS, many jobs may appear at some sectors which may arise to support that growth. Camaçari, for instance, can develop a small but important sector of urban industries such as motor mechanics, food and light transport.

The region, however, needs many more jobs, that must be provided on a more permanent basis rather than the temporary vacancies at the construction industry. The solution is, logically on the development of labour intensive industries especially those related to petrochemicals. We must bear in mind the point raised at Chapter one, about political and economic pressures that could be put on the pole if it shows itself incapable of providing jobs for the population. There are many segments of the down-stream petrochemical industries which have a much higher labour/capital rate than the industries already set on the pole.

The main difficulties to pursue policies with this aim is that the main bodies responsible for the development of the pole give more incentives to the basic industries than to a second plan for the encouragement for the definitive consolidation of the pole. Even the creation of PROPAR is not sufficient to solve this problem. On the contrary, it is a clear demonstration that the snag is still present.

For reasons explained throughout this thesis, we cannot see a solution to the unemployment building up of unskilled workers at Camaçari unless a change of policies takes place. If the purpose is to build a pole, the incentives should not be directed exclusively to the core, especially when it is not a traditional activity of the region, whose human resources are not automatically attracted to embark on this new and unknown sort of business enterprise.

According to initial expectations, Camaçari would provide more than 150 thousand indirect jobs, some of them being for unskilled or semi-skilled people. As this has not happened, and the firms coming to settle at the COPEC site are very short of the number originally forecasted, the commitment of the main responsible authorities of the pole has to be even stronger.

From the arguments and figures in the previous pages, it is clear that the localisation of the labour force around the pole is of an utmost strategic importance for the industries. There is no point, at this stage, to turn Camaçari into a working class suburb, Salvador and the surrounding localities being the dormitory areas for the high paid employees.

From the business side, the housing of the workers at Camaçari would save on several grounds. It saves on energy and on the costs of transport, it diminishes the physical and psychological stress of workers due to long journeys to work, it favours the development of the urban sector, necessary for the creation of service industries to support the pole. In the long term, the rationalisation of the movement of people could be of utmost importance

for the quality of life in any metropolitan region.

#### 6.9. AN INDUSTRIAL LOCAL STRATEGY AT CAMAÇARI

Camaçari has two features which have to be highly regarded in any local industrial plan:

- (a) the NPP is a government-business venture;
- (b) Camaçari is a small town inside a metropolitan region with a population of over 1.1 million, but one that is not fully integrated in terms of urban life.

The immediate conclusion is that there is not an isolated solution for the question. The problems of Camaçari are in this way a local, regional and national matter for which both the public and the private sector are directly responsible.

##### 6.9.1. A medium term strategy for Camaçari

Looking at the organisation of the NPP as analysed on chapter four, there is clearly an overlay of authorities working on the same field, without a clear-cut demarcation line between their responsibilities. This has led to some discrepancies in the division of duties and responsibilities among the different authorities.

Furthermore, if the special status given to Camaçari could have been justified at the beginning, that would not be the case with the slow integration of the Metropolitan region. Actually, the units responsible for the planning of Camaçari and Simoes Filho, the COPEC and the CIA, are already requiring a higher degree of coordination. COMCOP is too big and dispersed to be an effective planning or operation unit. It's better placed for consultant tasks as it is now. CONDER logically should be the unit to set the guidelines for the whole area. But with a metropolitan region that is still a collection of scattered towns, it is strongly opposed to be the coordination body for the petrochemical sector. Besides that, any unit

responsible for planning at the metropolitan level tends to be more involved with Salvador due to the scale of its problems, relegating the other towns to a second plan. Due to its proximity and relationships, the best solution, then, is an integration of the COPEC and CIA for the coordination of both the Industrial Complex of Aratu (CIA) and the North East Petrochemical Pole. That could be done with the participation of CONDER or a similar unit that tends to get in the long run a bigger say in the industrial planning at the metropolitan region. With the present rate of growth, one may expect that the main functions of the RMS in ten years time will be much more closely integrated than it is nowadays. If the present trends are steady, the public sector also will assume an even higher role in the economy, a reason why a corporate plan for industry will be more and more entangled with the planning for the public sector. The prospects, then, are for an increasing integration of the planning process of Camaçari and surrounding areas.

As the fight for the establishment of the transformation industry based on petrochemical feedstocks continues, there is an urgent need to define which segments should be settled at Camacari and those that should be located outside its boundaries throughout the North East to consolidate its role as a regional pole. The work done by PROPAR has been of limited reach up to now. A further concentration of 3rd and 4th generation industry at Camaçari could provoke an outcry in the remaining areas of the NE. Industries at other remote places fear that the location of industrial plants at the backyard of the NPP would be unfair competition. A balance, then, has to be reached, whereby Camaçari should house especially industries destined to attend the market of Bahia and the heavy and intermediate products. At the same time, labour intensive industries using petrochemical or other feedstocks are urgently needed to provide jobs for the massive and growing unskilled population of the RMS.

The increasing population and social problems at Camaçari requires also a change in the allocation of the taxes raised from the NPP, giving priority to social aspects rather than to the physical aspects of planning.

#### 6.9.2. Long Term Strategy

The long term strategy at the Metropolitan region of Salvador is mainly the consolidation of the industrial efforts already undertaken. I do not refer only to the petrochemical industries in the long run. That could be a short sighted view.

One of the main problems of the industrial efforts at the RMS is the lack of definition of a specific line of industries that could be advantageously located there. The NPP has only partially solved that point, due to the diversified nature of the down-stream industries that are based on petrochemical feed-stocks and the difficulties of attracting them.

The choice of these industries should not be based only on technical studies of financial profitability, unless the pole decides once and for all to give up its initial objectives. At this stage of consolidation, special attention can be put on those kind of industries that could provide more jobs for the thousands unemployed workers at the region.

There is a need for effective policies to consolidate some segments of business that could be based on the pole. Two sectors have appeared with good projects. The first one was the up-stream metal-mechanical business, which had already some tradition at Salvador on a small scale, and that received a real boost with the perspectives to supply small equipment for the pole. Besides the "Projeto Caraiba" and an open demand for plugs, compressors, electrical appliances and the like which definitely creates a fertile field for the development of this sector. The second is the light services industries for the new population and employees.

As regarding the down-stream industries, it is time to concentrate efforts on specialised fields. The desperate policy of looking for whichever industry wanting to come to Camaçari must yield its place for a careful build-up of an industrial strategy based on those segments of the petrochemical industry for which the RMS shows a natural inclination.

#### 6.10. CONCLUSION

There is no denying that the NPP has changed completely life at Camaçari, with additional influence on the adjacent towns in the RMS. The town has increased in population, in income, trade, output and services. The Municipal budget jumped from 3 million to 25 million cruzeiros in historic values, which is by itself a valid indicator of the economic growth of that municipality. By its amount, the industrial output growth is proportionately significant also for the RMS and the state of Bahia (see table 6.6).

The growth of that town, however, has not been matching the needs of its indigenous population and unskilled migration. Study of the characteristics of the migrants and of the local government expenditure has shown this aspect.

The pole was intended to be a "nucleus" of regional development, but its linkages up to now are mainly at Camacari and Even in terms of migration, the influence of Camaçari has been restricted to an area close to the town (Table 6.4. and diagram 6.3).

The attainment of the NPP objectives requires, then, changes in the industrial policies pursued by the pole, on different aspects:

- (a) more sustained expenditure on social policies at Camaçari;
- (b) integration of the planning efforts of the RMS;
- (c) definition and selection of a strategy for the development of the transformation industry at Camaçari, in the RMS, in Bahia and in the NE as a whole.

General Conclusion



The material presented throughout this thesis, especially on chapters One, Two, Three and Six, has shown that our initial propositions (a) are right, since the development of the NPP had its immediate impact concentrated on the Municipality of Camaçari and the RMS. Those industries were not complementary to the traditional economic activities of the area. In effect, a broad picture of the North East region indicates that a highly concentrated technological industry with weak linkages will not be sufficient to distribute the effects of the pole to an area of 1.5 million Km<sup>2</sup>, with over 32 million inhabitants and in great need of jobs, capital and new entrepreneurial schemes to counter its present social and economic weaknesses discussed in chapter One.

In fact, petrochemical industries can perform the role of a growth pole (Chapter Two) due to their rapid growth, dynamism, wide range of products and interrelationship with the other sectors of the economy. The industries comprising the North East Petrochemical Pole have their core and other down-stream industries settled mainly at the Metropolitan Area of Salvador, giving little push to the spread of the transformation industries based on petrochemical feedstocks to other parts of the North East.

Being the leading industrial development project in the North East, headed by the Government, the North East Petrochemical Pole has strong social commitments derived both from the social responsibility any business has for the community in general but specially from its own strategy for consolidation. As the provision of jobs is expected to come mainly from the peripheral companies to be settled in the North East and there being no guarantee they will join the pole, the prospects of a major impact in the region are far from bright.

The evolution in government policies to create integrated industrial complexes to erradicate the problems relating the lack of regional linkages from the previous industrialisation programs has produced only partial results with the petrochemical poles. They have in fact a firm upstream regional connection with the oil industry, but fail to show any tendency to integrate with the traditional economic activities of the North East, especially in the down-stream sector. So, the weaknesses in the planning of the North East Petrochemical Pole is not related to the pole structure itself, since the nature of the petrochemical industry demands that kind of structure (chapter Two), but are connected with this failure to create linkages with other economic activities of the region. The pole plan stopped at the core industries, while a plan for regional development should have gone much further down to the consumer-end industries. It was unbalanced planning without regional participation and no priorities for the local enterprises. The most serious problem of the North East Petrochemical Pole has been the lack of priorities the down-stream industries have received from the outset. The consolidation of the pole requires a change in the planning process with stronger backing for these peripheral units to come into the region, to grow and to overcome their main weaknesses - a restricted quota of feedstocks, a prices and payment policy which leads to rapid deterioration of working capital, a poor regional market and the lack of local experience in producing chemical products from petrochemical feedstocks.

Propositions (b) are related to new policies that could turn a pole with weak linkages with the overall economy of the region into an effective tool of development. Again our study on chapter Three confirms that our proposition on (b.1) about the development of broad linkages of industries all over the region to consolidate and strengthen the industrial complex at Camaçari and taking advantage of the existing

human resources in the area is a necessary and urgent step. As one of the main difficulties for the development of those linkages is the lack of participation of the regional human resources in the initiation and implementation of the pole, this problem assumes strategic importance in the consolidation of the North East Petrochemical Pole. It is certain that the capital-intensive nature of those industries has minimised the problems of supply of labour in underdeveloped regions, so that the firms in the pole, contrary to the general expectations, did not have to invest a great deal to handle this issue. Nevertheless, an extra burden of investment especially on training and development of human resources has fallen on the government network of education which has failed to respond adequately to that challenge for the reasons set out.

Policies intended to create the right atmosphere for the development of the human resources (proposition b.2) have to take into account the lack of skills and knowledge of the regional manpower in the making of petrochemicals as well as the lack of experience of the regional entrepreneurs in this field. Entrepreneurs tend to develop a product, a service or a market, where they have experience, knowledge or new ideas to offer. Entrepreneurs cannot operate in setting up an economic activity they hardly know. They need incentives, understanding and a close participation in the works of the pole. This can be a slow process but could be speeded up by the adoption of the right policies. The same can be said of the creation of skills and knowledge required by the different categories of human resources, which need continuous development to face the implementation, functioning and consolidation of the basic complex and of the down-stream industries. Throughout this thesis we have criticise several policies adopted in the human resource field but with a particular emphasis on the present need for global new strategy for the absorption of new know-how in petrochemicals, and for

the development of new skills and knowledge rather than on the creation of new University Institutions, when the present ones are theoretically able to supply the North East Petrochemical Pole with the required manpower.

The short time lag between the planning of the various Brazilian poles did not provide sufficient time for a bigger exchange of experience, know-how and skills that would be made easier if the development of each new pole was planned as an extension of the previous ones. All these facts are crying out for a national strategy in the development of skills, knowledge and know-how in petrochemicals.

Unfortunately, the scheme scheduled to create new technology and assure the domestic participation has not worked as it was envisaged and the 'tripartite policy' is not even the skeleton it should be. So, our proposition (b.3) about high cooperation among Brazilian domestic sector, multinationals and the Government did not prove right. That 'tripartite scheme' has neither proved to be an effective instrument of control nor has it a reliable tool to strengthen the Brazilian private sector in petrochemicals. Some other plans together with the improvement of the infrastructure of knowledge and with the development of the human resources must be made.

Regardless of whatever changes the pole has brought to Camaçari and even to the Metropolitan Area of Salvador, it is clear that the North East Petrochemical Pole as a whole is far short of being a 'push-force' of regional development. Its influence outside Bahia is minimal. Even if we take it that the financial resources derived from taxation can improve the image of Camaçari, a better structured local community would not be able to hide the weak impact of the North East Petrochemical Pole in the whole region. That is hardly possible because it is an integral part of the whole RMS and it is the RMS that needs to be improved as a whole. The reason is that regional

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planning goes far beyond the simple decision to build some basic complexes at a given geographical point. The planning of a huge industrial complex regardless of its linkages is planning for an industrial enclave, that may increase the amount of taxes paid to the Treasury, but it is incapable on its own of being the 'catalyst' for a structural change. This planning is unbalanced, short-sighted, handicapped. The planning of a pole has to go right down to the peripheral units, to the transformation industries, to the existing economic activities, to the global involvement of the local human resources (from the entrepreneurs to the unskilled population) in the development of the pole. It is exactly here where the main sin of the North East Petrochemical pole overall planning lies.

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Annex N. 1 - Enterprises belonging to the North East Petrochemical  
Poie and locate in the RNS.

A - Enterprises in the COPEC area (in operation):

Name of the Firm	Start of operation	Jobs
1. COIENE/CEMAN - Central de Manutenção de Camaçari S/A	1974	2,289
2. COPENE/CEMAP - Central de Matérias Primas S/A	1978	1,079
COIENE/UTIL - Central de Utilidades	1976	360
3. COIENE/CETREL - Central de Tratamento de Eflu- entes Líquidos S/A	1979	156
4. CPB - Central de Polímeros da Bahia S/A	1979	345
5. CQUINE - Cia. Petroquímica	1973	736
6. CIQUINE - Cia. de Indústrias Químicas do Nor- deste	1968	217
7. COBAFI - Cia. Baiana de Fibras	1978	1,192
8. CQR - Cia. Química do Recôncavo	1979	238
9. COFENOR - Cia. Petroquímica do Nordeste	1979	224
10. CPC - Cia. Petroquímica de Camaçari	1979	700
11. EDN - Estireno do Nordeste S/A	1978	473
12. Etoxilados do Nordeste S/A	1979	66
13. FISIBA - Fibras Sintéticas da Bahia S/A	1971	700
14. Isocianatos do Brasil S/A	1979	687
15. Melamina Ultra S/A - Indústria Química	1975	225
16. Metanor - Metanol do Nordeste S/A	1976	208
17. Nitrocarbono S/A	1979	700
18. Nitrofértil-NE - Fertilizantes Nitrogenados do Nordeste S/A	1971	594
		<hr/> 11.189

(From previous page)		11.189
19. Oxiteno Nordeste S/A - Indústria e		
Comércio	1978	270
20. Polialden Petroquímica S/A	1979	554
21. Polipropileno S/A	1979	690
22. Politeno Indústria e Comércio S/A	1978	474
23. Pronor - Produtos Orgânicos S/A	1977	463
24. SULFAB - Cia. Sulfuquímica da Bahia	1977	100
		<u>13.740</u>

B. Enterprises in the COPEC area	Due to	Jobs
(in implementation stage or with	start in	
approved projects)		
1. Acrinor - Acrilonitrila do Nordeste S/A	1980	260
2. Basf - Química da Bahia S/A	1981	134
3. Carbonor - Carbonatos do Nordeste S/A	1981	79
4. DETEN - Detergentes do Nordeste S/A	1981	170
5. Diamond Shamrock do Nordeste S/A	1981	79
6. Empresa Brasileira de Catalisadores S/A	1981	35
7. Empresa Carioca de Produtos Químicos S/A	1981	63
8. FENOLAC - Empresa Brasileira de Fenol e		
Acetona Ltda	1982	323
9. Fertinor - Fertilizantes do Nordeste S/A	1981	400
10. MCA - Ultra Indústria Química Ltda	1982	51
11. Rhodia Nordeste S/A	1982	151
12. Ultramold Resinas Sintéticas S/A	1981	114
		<u>1.859</u>

Partial Total (A + B)

15.599

## C - Enterprises in the RMS but outside the COPEC area

Name of the Firm	Start of operation	Jobs
1. Barylsa - Tecelagem do Brasil S/A Location: CIA (Industrial District) Simões Filho - BA	1974	786
2. C.C.C. - Cia. de Carbonos Colcoidais Location: CIA - Candeias-BA	1968	240
3. Dow Química S/A Location: CIA - Candeias-BA	1977	580
4. FAVAB - Fábrica de Vaselinas da Bahia S/A Location: CIA - Simões Filho - BA	1974	42
5. PASKIN S/A - Indústrias Petroquímicas Location: CIA Candeias-BA	1972	800
6. SAFRON TEIJIN S/A - Indústrias Brasileiras de Fibras Location: CIA - Simões Filho - BA	1972	937
7. UNION CARBIDE do Brasil Ltda Location: CIA - Candeias - BA	1981	180
		<hr/> 3.565

Total (A + B + C) ..... 19.164

## C - Enterprises in the RMS but outside the COPEC area

Name of the Firm	Start of operation	Jobs
1. Barylsa - Tecelagem do Brasil S/A Location: CIA (Industrial District) Simões Filho - BA	1974	786
2. C.C.C. - Cia. de Carbonos Coloidais Location: CIA - Candeias-BA	1968	240
3. Dow Química S/A Location: CIA - Candeias-BA	1977	580
4. FAVAB - Fábrica de Vaselinas da Bahia S/A Location: CIA - Simões Filho - BA	1974	42
5. PASKIN S/A - Indústrias Petroquímicas Location: CIA - Candeias-BA	1972	800
6. SAFRON TETLIN S/A - Indústrias Brasileiras de Fibras Location: CIA - Simões Filho - BA	1972	937
7. UNION CARBIDE do Brasil Ltda Location: CIA - Candeias - BA	1981	180
		<hr/> 3.565
Total (A + B + C) .....		19.164



Annex n. 2 - Guide to the interviews with managers of petrochemical down-stream companies and transformation industries, held in the North East in the last months of 1979, and beginning of 1980.

1. Identification:

Name of the Firm:

Address:

Year of Foundation:

Interviewer:

2. What are the petrochemical raw materials used in your company?

Discrimination	O R I G I N	
	NPP	Others

3. What do you think of the quality of the NPP products?

What about supply, prices and payment policies?

4. Production Line:

Products	Main markets	
	North East	Rest of Brazil

5. Are there new Investment or Expansion Programs?

Details: \_\_\_\_\_

6. Are the foundation or the new expansion programs of your company related to the establishment of the NPP?

7. Has the NPI brought any specific advantage for your company?

8. Labour

Categories	Administration	Production	Total
	Staff	Staff	
Professionals			
Skilled			
Semi-skilled and unskilled			
total			

- Is there any difficulty in the recruitment of employees in the local market? What difficulty? For which occupation?

9. What are the main difficulties in the creation and management of the petrochemical down-stream industries in the North East?

Entrepreneurs?

Market?

Management skills?

Skilled labour?

Government Policies?

Others?

10. Has the government provided adequate incentives for the development of these new firms? Has your firm used the Government Incentives available?

11. Any other particular point do you want to make?