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CAPITAL GOODS INDUSTRY

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MEXICO

Technical report: Retrospective evaluation of the
Joint NAFIN/UNIDO capital goods project*

Prepared for the Government of Mexico
by the United Nations Industrial Development Organization
acting as Executing Agency for the United Nations Development Programme

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TABLE OF CONTENTS

INTRODUCTION	iii
SUMMARY	iv
PHASES OF THE PROJECT	
Phase I	1
Phase II	16
Phase III	26
HUMAN RESOURCES	30
FINANCIAL RESOURCES	36
OUTPUTS	40
PROSPECTS	45

INTRODUCTION

The industrial development of Mexico began at the end of the last century, though on a modest scale and without any basis for directing the growth of industries towards specific objectives. From the 1940s onwards, the world economic situation and the degree of political and economic maturity achieved by the country made possible sustained development of national industry. However, owing to the influence of technological, commercial and employment factors, the industrial sector was most dynamic in the areas of intermediate and final consumer goods.

It was not until the 1960s that various capital goods enterprises clearly emerged, although again they were set up without any preconsidered strategy, mainly for the purpose of achieving some degree of import substitution, making use of a promising market.

Nacional Financiera, in its capacity as the principal promoter of industrial development, decided in 1971 to give a strong boost to the capital goods industry and, in co-operation with the United Nations Industrial Development Organization, launched a joint project entitled "Development of the Capital Goods Industries".

The project, which was started in the same year, was modest in its objectives and scope and was consolidated in step with the growth of the Mexican capital goods industry, so that it has been extended until the present, in three phases with an average duration of five years each, though Phase II took almost eight years to complete.

The Mexican capital goods industry has now achieved a degree of maturity that enables it to continue its growth and consolidation, since Nacional Financiera has staff experienced in the promotion and management of the industry and the third phase of the Joint NAFIN/UNIDO Project is about to be completed.

This study, which sums up the activities carried out under the project from its commencement, is presented at the request of the Director-General of Nacional Financiera and attempts to evaluate its achievements and to point out some deficiencies which, although it is not believed that they jeopardized the success of the project, could serve as examples of what should not be repeated in the future, especially if collaboration between NAFIN and UNIDO is continued.

Finally, it should be mentioned that Phase I and II activities have deliberately been described in greater detail than those of Phase III; the reason is that the results of the latter phase are well known, since some of them are still in hand. Furthermore, it can be seen that many activities have taken shape since Phase I and were continued in the subsequent phases, resulting in coherent development throughout the project, and that the only activities modified were those that for various reasons were considered invalid at some time.

SUMMARY

In 1971, the Government of Mexico requested the United Nations Development Programme (UNDP) for assistance through the United Nations Industrial Development Organization (UNIDO) in carrying out jointly with Nacional Financiera S.A. a programme for the development of the capital goods industry in Mexico.

The initial duration of the joint project was nine months, which was later extended to 13 months so as to make it possible to achieve the results that it was hoped to obtain from the project.

The capital goods industry in Mexico was at that time passing through a phase of intense development, though it did not follow any pre-established growth strategy and was directed towards import substitution, basically owing to opportunities to manufacture locally at lower cost equipment required by industries producing other types of goods. It was therefore decided within NAFIN to take advantage of the support given to developing countries by UNIDO for the creation of industries that would assist in economic and social growth.

Initially, the project was directed towards studies, with the aim of ascertaining accurately the capacity of Mexican industry for the manufacture of capital goods and identifying the principal consumers of and customers for such goods. For that purpose, surveys of both users and manufacturers were carried out both by correspondence and by direct visits and interviews. The studies were supplemented with information on promotion mechanisms and on fiscal, credit, import, export and other policies that could influence the development or limitation of manufacturing industry in that sector.

Given such a broad approach and in view of the very clear objectives of the counterpart, UNIDO was able to co-operate in this work. The scope of the project was expanded and its duration was first extended to 1977, in the second phase, and later until the end of 1981. In the second phase of the project, the results of the initial studies were consolidated and an overall strategy was established for the development of the capital goods industry, considering this sector in the context of the economy as a whole, as well as its impact on the economy and on strengthening the country's technological fabric.

In 1977 and 1978, a first series of monographs on various subsectors of the capital goods industry was published under the project; this laid the foundation for intense project promotion, culminating in concrete investments, as is shown in table 4 (page 25). Taking advantage of the economic boom which the country was experiencing, direct investments, in which NAFIN played an important part, reached a value of more than \$US 1 billion, and more than 5 000 direct jobs were generated. All of these investments came about thanks to work carried out under the capital goods project, but other investors, especially in the private sector, also welcomed the results of the NAFIN/UNIDO programme and carried out various projects, especially in the fields of boiler-making and electrical equipment.

In 1981, when the second phase of the project was concluded, 10 publications in the form of monographs and global strategy documents had been issued, more than 50 projects had been studied, a dozen new enterprises had been set up and a number of support mechanisms for the Mexican capital goods industry as well as for the Federal Government had been established.

Unfortunately, owing to the economic crisis suffered by the country from that year onwards, many of the investments were deferred and some were even cancelled, so that the objectives of the third phase of the project had to be reoriented in an attempt to consolidate its previous achievements and to seek new mechanisms for support to NAFIN and the capital goods industry.

Thus, in this last phase, the project activities have consisted in analysing the present capital goods situation in Mexico and in other countries such as the Republic of Korea and Brazil, with the aim of identifying action for capitalizing

on the experience of industry, so as to propose mechanisms for its consolidation and in some cases its reorientation or restructuring. In this last phase, the project has published three other studies and is about to complete another series on subsectors of capital goods.

To help in achieving the objectives that were established from the outset, the joint NAFIN/UNIDO capital goods project has received contributions of more than \$US 3.5 million from the United Nations Development Programme and more than 250 million pesos from Nacional Financiera.

Most of the resources assigned to the project in these 15 years were used for the recruitment of experts, UNIDO experts numbering more than 70. For its part, NAFIN organized direct participation in the project by more than 250 professionals; they collaborated closely with the experts and were trained in various fields, both technical and economic, related to capital goods.

The achievements of the NAFIN/UNIDO programme can be classified in two groups, those of a strategic nature with a qualitative impact, and projects with concrete effects on national industry. Among the achievements of the first type, we can mention the contribution to arousing national awareness of the importance of capital goods to the country and the assistance rendered in establishing a global strategy for the development of the Mexican capital goods industry.

The concrete results are summed up in 12 projects, which, as indicated above, resulted in a level of investment of over \$US 1 billion, considering only enterprises in which Nacional Financiera participates directly. The other investments derived from the studies carried out under this project have not been quantified, but it is estimated that they amount to approximately \$US 500 million. Furthermore, 10 sectoral monographs on the principal types of capital goods have been published under the project and four on global strategy. Also, some 50 investment projects have been carried out within NAFIN; these require updating but are ready for promotion when there is a turnaround in the Mexican economy.

The prospects are that future collaboration between NAFIN and UNIDO will revolve mainly around activities directed towards consolidating and restructuring capital goods enterprises, so as to reinforce the achievements of this project.

PHASES OF THE PROJECT

The Joint Project between Nacional Financiera (NAFIN) and the United Nations Industrial Development Organization (UNIDO) was launched in 1971 and was financed with funds from the United Nations Development Programme (UNDP). From the very beginning it was considered that, if possible, that is to say, if the necessary funds were available, the project should last several years. That would permit the planning and implementation of Mexican capital goods industry development by means of projects specifically promoted in the light of the results that would be obtained through the activities that were to be carried out. Therefore, from the design stage, the project was planned to be carried out in three phases.

Phase I

The initial agreement was to carry out Phase I of the project, consisting of basic economic studies, which were intended to identify the growth potential of the Mexican capital goods industry. Phase I was also to include the planning of activities that would make it possible to implement such investment projects for specific capital goods as would be identified, formulated and evaluated and found to be feasible in an initial phase. In a final phase, it was considered that, if the projects were implemented, the UNIDO assistance required would focus on research and development as well as on marketing techniques.

As was indicated above, Phase I of the project commenced in November 1971 and was scheduled to last nine months. However, in the course of the project, it was decided to extend this period to 13 months and thus conclude this phase of the work in March 1973. The reasons were that initial problems were encountered by UNIDO in obtaining suitable experts at short notice, that there was not sufficient information and that the information that was available was not organized in such a way that conclusions could be arrived at in such a short period.

The initial objectives of the project were to identify the growth potential of the capital goods sector and to draw up a list of various types of equipment which it was feasible to produce locally.

In addition, an attempt was made to determine the impact of the country's prevailing industrial policy and its direct effect on the development of the capital goods industry.

To achieve the results envisaged, a number of activities were planned, consisting of economic studies to supplement some studies available within Nacional Financiera which served as a reference framework for new studies.

The activities were organized on a multidisciplinary basis in order to cover the necessary technico-economic analyses, and the studies concentrated on an analysis of domestic market possibilities, while only marginal consideration was given to the long-term possibility of exporting some capital goods. Only in the case of certain capital goods was the possibility suggested of examining the existence of a probable export market, for the purpose of ensuring a level of production that would suffice to guarantee a suitable volume of manufacturing output and thus also to develop industrial plants oriented towards the export of equipment.

With regard to government policies and their impact on the development of the capital goods industry at that time, the purpose of the work was to obtain information as a basis for formulating, in the subsequent phases of the project, some suggestions for modifying these policies so as to increase and accelerate the growth of the capital goods sector and ensure its greater participation in the country's economy.

The technological aspects were analysed solely on the basis of the information compiled during visits to industrial plants; this analysis served as a basis for proposing some initial policies that would permit the technological development of the Mexican capital goods industry. This information also revealed the limitations of that sector at the time.

Various difficulties encountered in the course of the project prevented the completion of the planned activities in time, so that some of them had to be postponed to later phases. In particular, it should be mentioned that, in the fields in which it was considered desirable to determine export possibilities, it was not possible to identify precisely to which countries equipment of Mexican origin could be supplied, so that this activity was among those postponed to a later phase, in the hope that more staff and the necessary information to permit evaluation of that possibility would be available.

However, a tentative list was drawn up of the capital goods whose development would be interesting in Mexico and of those that could be considered feasible for export to other countries, in order to permit a preliminary discussion with industrialists and some potential foreign investors regarding their participation in industrial projects as investors and/or suppliers of technology.

The visits carried out to national industrial plants to determine their technical production capacity and growth potential were confined to a representative number of plants, since the only purpose was to obtain an overall initial picture of the prevailing situation in the sector; as a result, only indicative but not exhaustive information on the industry was necessary.

To sum up, the project was carried out by means of simultaneous action along three different lines:

1. Carrying out basic macro-economic studies of various capital goods and studies by branch;
2. Establishing contacts with national and foreign producers of capital goods; and
3. Making a preliminary evaluation of the degree of technological development achieved by Mexican industry.

GENERAL METHODOLOGY

Study of the market for capital goods in the economic field is a rather complex activity and calls for the consideration of a large number of products on the one hand and of relevant demand projections for them in all sectors of the economy and production on the other hand. For that purpose, it is necessary to have a very complete statistical base that will make possible proper analysis in that context. This aspect was one of the serious limitations in carrying out the Phase I studies since at that time there was neither a standardized classification nor a sufficiently detailed breakdown of the groups of capital goods used in Mexico, with the result that the information was incomplete in most cases.

In the industrial development of the country, a very wide degree of diversification had been achieved in various enterprises, some of which already had modern machinery and an adequate level of technological development, as well as sophisticated management and appropriate marketing procedures. However, on the other hand, very little statistical material was available, both for the industrial sector and for other sectors that could help in verifying the results that the project proposed to achieve as its initial objectives. Consequently, the information compiled by the working group proved to be partial and insufficient in many cases; in addition, it was sometimes too vague and in other cases covered various groups or branches of the capital goods sector, and any possibility of making a breakdown was ruled out.

Accordingly, analysis of the prevalent structure on the production side and future related trends in the manufacturing sector and among the principal consumers of capital goods constituted one of the most difficult aspects to be dealt with by the project.

The above-mentioned limitations did not prevent the carrying out of surveys, and the following action was taken on the basis of the material available:

1. Analysing the major production sectors that could consume the largest possible number of capital goods;
2. Preparing demand and growth projections for those sectors; and
3. Evaluating trends in the import of capital goods for the sector selected.

The selection of production sectors to be evaluated was based on various criteria, including their annual growth rate, share of GDP, the extent of investment (especially in terms of capital goods), the priority granted by the Government, investments of capital and the availability of statistics. Jointly with the Nacional Financiera working group, the following 14 industrial branches were selected for evaluation:

- (a) Iron and steel industry;
- (b) Non-ferrous metals industry;
- (c) Mining industry;
- (d) Construction industry;
- (e) Cement industry;
- (f) Pulp and paper industry;
- (g) Sugar industry;
- (h) Chemical industry;
- (i) Food industry;
- (j) Textile industry;
- (k) Electricity generating industry;
- (l) Electrical engineering and electronics industry;
- (m) Agro-industry;
- (n) Machine-tools.

The branches selected represented approximately 34 per cent of the total 1970 GDP (at 1960 prices) and five of them, the chemical industry, agro-industry, the food, construction and the textile industries, accounted for 28 per cent of total GDP, or almost 80 per cent of the total value added generated by the branches selected. Of these five branches, the chemical, textile and construction industries had the largest shares of the GDP and annual growth rates higher than the historic average. Only the food industry was slightly below the average as far as its annual growth rate was concerned. Together, the 14 branches selected had an annual growth of 7.6 per cent, thus exceeding the growth rate of GDP, which was 7.1 per cent per annum.

DEFINITION OF CAPITAL GOODS ACCORDING TO THEIR UTILIZATION BY THE MAIN CONSUMER INDUSTRIES

Solely for the purposes of the project and with the aim of providing a reference framework, capital goods were defined as the mechanical, electrical and

non-electrical equipment and their principal components used as production equipment in the 14 branches selected. Capital goods used in branches other than those selected, for instance, transport equipment, products not used directly for production, such as office machinery and auxiliary equipment, pipes, cables, couplings and connections, were not included in the first phase. The reason was, as indicated above, that detailed information did not exist at that time and it was not considered necessary to take all of these components into account, since that would further complicate the work on the statistical analysis of each individual sector.

The principal sources of information used were the statistical yearbooks on the foreign trade of the United States of Mexico, published by the Directorate General for Statistics of the Ministry for Industry and Commerce, which provided the most recent data on imports of capital equipment, according to the BTN system.

Unfortunately, the use of this system entailed an additional complication, since certain data such as the statistics of the United States of America and those published in Mexico were incompatible for purposes of comparison, so that the Mexican statistics had to be converted to the SITC classification, which did not always correspond to the definition of the capital goods that was given; this greatly complicated the work.

Another important source of information was found in the studies on the possibilities for the manufacture of machinery and heavy equipment and the situation of heavy industry in Mexico and the market for heavy equipment in Mexico, both well-known sources, as well as the NAFIN/WALTER study, which together covered seven branches:

- Iron and steel industry;
- Non-ferrous metals industry;
- Mining industry;
- Construction industry;
- Cement industry;
- Wood and paper industry;
- Sugar industry.

However, these studies concentrated only on demand for heavy mechanical equipment, so that it was necessary to make adjustments in order to be able to evaluate the total demand for capital goods in terms of the definition adopted.

Other statistics and studies available from various sources were used in the project and it was sometimes possible to make 10-year projections for certain sectors. On the basis of all the information available, requirements for capital goods in the period 1976-1980 were estimated, although in some cases indirectly, by mathematical methods. In most of the branches selected, the following evaluation methodology was applied:

Each of the branches was evaluated in terms of annual growth of gross output (in physical units and/or value) or by using its contribution to the GDP (value added at 1960 prices); "apparent demand" was also considered, that is to say, production plus imports less exports, as well as other factors. The data available in most cases referred to the ten previous years. In order to determine the most important aspects affecting future trends in each sector, it was necessary to make an analysis of their impact within the economy in order to supplement the data obtained.

The growth trend for the sector was calculated for two periods: one up to 1975 and the other, as indicated above, from 1976 to 1980.

An estimate was made for the latter period, considering the most important factors of demand, such as:

- Increase in gross production;
- Increase in production capacity;
- Investment required to achieve the increase in production capacity of the branch;
- Capital goods requirements, including replacements for obsolete or depreciated machinery.

An attempt was also made to break down all capital goods by value in each branch into groups of equipment, using a uniform classification for all branches and separating the equipment that was used mostly in one or a number of branches from that required in other sectors.

The work carried out during Phase I of the project led to the following conclusions, and the following aspects of the Mexican capital goods industry were identified:

(a) **TECHNICAL LEVEL:** As the growth of the capital goods industry had been very rapid in recent years and as significant progress had been achieved, especially in the previous decade (1960-1970), the conclusion reached in work on the project was that the national industry was technically capable of producing practically any type of capital good required by the Mexican economy. However, this technical capacity was still available only for special installations and equipment, since the following manufacturing activities and plants related to capital goods already existed at that time:

1. Iron and steel castings;
2. Machining workshops for producing intermediate and small capital goods;
3. Complete installations for manufacture and welding capable of producing medium-sized or larger capital goods;
4. Installations for the production of boilers, condensers and packaged power plants for the generation of electric energy with steam;
5. Complete iron and steelworks for the production of all types of flat and non-flat products.

The work carried out under the project also revealed in general a production capacity at the worker level that was much greater than in any other developing country. In particular, it was established that in operations such as welding of steel products, operators were in many cases of better quality in terms of the number of man-hours required for carrying out work than in the United States of America. The quality of the work done in boiler-making shops showed that further inspection, with the use of X-rays, for example, was unnecessary and that high repair costs caused by defective work were not incurred.

In precision operations that require a high degree of training of operators, the amount of rejects of machined articles with tolerances of ± 0.005 " was in one case 20 per cent less than that achieved by a United States factory.

In another plant, this type of operation was carried out at 16 per cent less cost than in the United States parent company.

- (b) **SUGGESTIONS FOR INCREASING EFFICIENCY:** In general, one of the characteristics observed in Phase I of the project was that production costs for capital goods were extremely high, while the degree of utilization of machinery was extremely low. These factors obviously prevent rapid and sustained development of the capital goods industry.

Therefore, one of the principal problems detected was that existing industrial plants were working at a low level of efficiency, which strongly limited future expansion of their installations and thus also any thought of selecting new industrial plants for establishment in Mexico. Furthermore, one of the essential requisites for ensuring that the capital goods industry could be considered suitable for competition in external markets was operation at high levels of efficiency; this was revealed as a serious defect in the first study.

At plant level, a number of organizational measures were detected that are necessary to achieve that high degree of efficiency.

- (c) **QUALITY CONTROL:** Although an appropriate organizational set-up for carrying out quality control tasks was discovered in some enterprises, this function either did not exist in the vast majority of enterprises or, if it did, the necessary importance was not attached to it.

To manufacture capital goods suitable for the needs of the country, it was shown to be vitally important to develop a programme for manufacturing products of high quality and reliability. This need should be considered from the very phase of planning in the case of newly established enterprises.

Establishing a quality control programme implies formulating specifications regarding the product, the manufacturing process and organizational aspects, which should be considered right from the start. One of the minimum requirements is to prepare purchasing specifications, to establish manufacturing standards and specifications and to have testing specifications and methods that are appropriate for the product.

- (d) **PREVENTIVE MAINTENANCE:** In various industrial plants, it was discovered that equipment was neither repaired nor properly protected and also that some of the spare parts used were not those required; in some cases, maintenance did not even include proper lubrication of the machinery. These defects and omissions cause extremely high costs as the result of stoppages and the need to carry out continuous major repairs. It was established that the introduction of preventive maintenance programmes was of the highest importance in a programme for the development of the capital goods industry, especially for the extremely expensive and complex equipment of the type usually needed for the manufacture of industrial machinery and equipment. In relation with this aspect, the need was also identified that future users of capital goods produced in Mexico should have at their disposal detailed documentation and manuals, to enable them to set up their own preventive maintenance programmes for equipment and machinery purchased from national manufacturers.

Therefore, the preparation of maintenance manuals and other support documents and a sales service for the equipment to be produced in Mexico was recommended as a matter of priority in the capital goods sector.

- (e) **TESTS ON THE AVAILABILITY OF MACHINERY:** Tests to determine the degree of availability that can be expected from any machine should normally be carried out by industrial engineers.

The output of the equipment in a plant should be documented and compared in terms of operating times and capacities with the specifications for each equipment item. Such results are used in the manufacturing process by production engineers and heads of Department for the proper selection of production equipment and specific processes for manufacturing the various types of capital goods.

- (f) **COST REDUCTION PROGRAMMES:** These programmes are of the greatest importance for achieving rational production, for reducing costs in the various steps of the production process and in the use of raw materials; these factors have a strong influence on the final cost of the product.
- (g) **MANAGEMENT SYSTEMS:** These systems are of the greatest value for improving specific manufacturing operations and practices in a factory. The staff working directly on each machine can generally make suggestions for reducing costs, so that it was recommended that management systems be established with the participation of the entire staff involved in the manufacturing process.
- (h) **SAFETY PROGRAMMES:** Proper safety programmes should be established with the aim of avoiding accidents and dangerous practices in the production of the equipment and machinery of every enterprise.
- (i) **SYSTEM OF STANDARDS:** The prevalent practice in 1971 with regard to the use of industrial standards represented a serious problem for the country. While Mexican industry has historically developed in close contact with industries in the United States of America, the official Mexican measurement system is the metric system, so that plants have been continuously confronted by a conflict between official standards and normal manufacturing practice.

Owing to this situation, various observations were formulated during Phase I of the study. Some equipment, manufactured according to certain standards, has had to be fitted in units that are constructed to another type of standard, which has caused problems regarding installation, space and coupling one machine to another. The following cases are examples of great importance:

- Though the standards for screws and fasteners are metric, they were not respected in Mexico, since all such equipment was manufactured to North American standards; that has normally caused confusion and installation problems between units from European countries, for example, and those from the United States.
- In some cases, the electrical engineering industry already applied metric standards, but there was no degree of uniformity throughout the sector.
- Iron and steel products manufactured in Mexico were produced according to the North American standardization system, so that they did not comply in any way with the official national standards.

This complex of problem was mentioned at various meetings held with the Director-General for Standards of the Ministry of Industry and Commerce; however, there was no indication of any plan to correct this conflict situation within industry.

Although it was suggested that seminars and educational programmes be organized in an attempt to change production practices and make a beginning with manufacturing according to the official metric system, no significant progress was made during this phase of the project.

Finally, with regard to standards and controls, it was found that the Ministry of Industry and Commerce already had some systems for awarding guarantee seals for some products, but it was not a widespread practice to certify the quality of products, especially if it was planned to introduce them on export markets.

Table 1

SUMMARY OF NEEDS FOR CAPITAL GOODS IN THE PERIOD

1976 - 1980

(Million pesos)

Branch	Value of demand	I m p o r t s	
		Value	Percentage
Iron and steel	4 630	3 037	65.6
Non-ferrous metals	3 380	2 328	68.9
Mining	4 500	2 415	53.7
Construction	9 400	2 720	28.9
Cement	2 340	932	39.8
Pulp and paper	4 630	3 343	72.2
Sugar	3 390	450	13.3
Chemical industry	18 000	4 030	22.4
Food industry	7 420	3 476	46.8
Textiles	11 200	10 667	95.3
Electricity generation	15 000	9 662	64.4
Electrical engineering and electronics	2 530	1 824	72.1
Agriculture	15 840	3 912	24.7
Machine-tools	100	90	90.0
Totals	102 360	48 886	47.8
Total for other activities	67 640	34 093	42.6
Total for the economy	170 000	82 979	45.5

Table 2

IMPORTS OF CAPITAL GOODS ENVISAGED FOR THE PERIOD

1976 - 1986

(Million pesos)

717.1	Textile machinery	8 087.4
722.1	Electric power machinery	5 717.8
719.2	Pumps and centrifuges	5 346.4
724.9	Telecommunications equipment	5 103.5
711.5	Internal combustion engines, other than for aircraft	4 811.6
715.1	Machine-tools for working metals	4 582.3
719.8	Machinery and mechanical appliances	4 327.9
719.1	Heating and cooling equipment	4 068.9

SUMMARY OF DEMAND PROSPECTS FOR CAPITAL GOODS

In Phase I of the project an estimate was made of capital goods requirements for the period 1976-1980 in each of the branches selected and indicated above. The total value of these requirements was of the order of 47 518 million 1960 pesos; this figure represents principally heavy and specialized equipment for the above-mentioned sectors. However, not all of the needs of each sector were covered but only a specific level of production. The total estimates of capital goods required for the selected branches, after some adjustments, were quantified as being of the order of 102.36 billion pesos (1960). Considering that the branches selected represented approximately 60 per cent of the total demand for capital goods, it was concluded that the capital goods required for other economic activities should be evaluated at approximately 67.64 billion pesos (1960). Accordingly, the total demand for capital goods by the entire Mexican economy for the period 1976-1980 was estimated to be of the order of 170 billion pesos. The possible imports of capital goods for the entire economy were also calculated in the course of this work and it was found that they would reach the 47 per cent level.

Table 1 summarizes the demand prospects for capital goods in the fourteen branches selected and the percentage of imports in the light of the situation and economic prospects at that time.

To indicate what capital goods would be imported in the period 1976-1980, projections were made, with the results shown in table 2.

The above-mentioned groups represent a total of 42 045.8 million pesos, that is to say, more than 50 per cent of the total imports of capital goods envisaged in the period in question.

From the results obtained during the period November 1971 to March 1973 it was concluded that investigations on capital goods should be continued, and it was decided to work on what was called Phase IB, as a continuation of the project, which was expected to last until September 1973.

During that period, the following work was carried out:

- Continuing the formulation of the detailed projections of domestic demand for, and expected imports of, the main capital goods, which had already been started during Phase IA;
- Carrying out additional technico-economic studies, especially for some subsectors of capital goods, such as electrical equipment, which had not been covered in depth in the previous work;
- Detailed determination of domestic production capacity for various types or groups of capital goods, including proposals for expansion, ascertaining what expansion was in hand or being considered by the various manufacturers in Mexico;
- Detailed identification of existing technological and production deficiencies in industry, in the context of the points dealt with above and grouping products for consideration in possible industrial projects; and, finally
- Formulation of a specific policy proposal and other measures for promoting the development of plants manufacturing capital goods identified within the groups and subsectors analysed.

In addition, investment profiles were prepared for the principal groups or types of equipment, where there was ample potential for their manufacture in Mexico, for the purposes of the promotion work to be carried out among national industrialists and possible foreign investors.

In the context of the methodology used for the work carried out in this first stage of the project it was concluded that the projections of demand and imports made for the period 1976-1980 were adequate, since if some plants manufacturing capital goods were established, they would take two to three years to reach an acceptable level of production. Accordingly, it was not necessary to consider demand before the year 1976, as it was not feasible to establish new plants or expand existing ones that could satisfy needs before that date. It was also considered that if projections were made beyond 1980 they would probably not be realistic and it would be necessary to wait in order to ascertain the performance of industry on new bases before longer-term projections could be made.

In this phase, more detailed and intensive surveys were also made through visits to various manufacturers of capital goods, both by the UNIDO experts and by the counterpart personnel. Likewise, several meetings were held with the representatives of the Ministry of Industry and Commerce and other government agencies as well as with Chambers of Commerce and similar associations in order to obtain supplementary information and refine the data obtained during Phase IA.

As a result of the visits and meetings indicated, a new group classification of the various types of capital goods was worked out and is shown in table 3. This list, which is more detailed than those worked out initially, enabled us to identify better the production and technological needs that were to be met so that the capital goods industry could develop and satisfy the country's needs to the maximum extent possible up to 1980.

An attempt was also made in this phase, for the first time, to group in investment projects various types of capital goods whose manufacture was detected as being possible, both for new enterprises and for the expansion programmes of existing plants in Mexico. However, this classification still had to be considered as preliminary, and much more detailed verification was required by means of formal pre-investment studies, which should be carried out during the subsequent phase of the project, as a basis for decisions on viable investments. Since the project had only limited resources, it was considered that these pre-investment studies could be carried out directly by the groups of entrepreneurs involved, both local and foreign. However, some studies were prepared directly by the UNIDO and Nacional Financiera team, with the aim that NAFIN itself would make the required investment.

It is important to stress that, from this first phase of the project, the working group envisaged that, although considerable export possibilities for capital goods manufactured in Mexico did exist, this industry would have to commence its development on the basis of the domestic market, since local demand represented adequate support for an industry and export would only be a supplementary factor in its consolidation.

Table 3

CLASSIFICATION OF CAPITAL GOODS

1. NON-ELECTRICAL EQUIPMENT USED IN VARIOUS PRODUCTION SECTORS
 - 1.1 Non-electric power-generating equipment
 - 1.2 Machine-tools
 - 1.3 Other metal-working machinery
 - 1.4 Machinery for packing, packaging and painting
 - 1.5 Heating and refrigeration equipment
 - 1.6 Pumps, centrifuges and compressors
 - 1.7 Materials handling, transfer and loading equipment
 - 1.8 Other machines
 - 1.9 Parts and accessories
2. NON-ELECTRICAL EQUIPMENT USED IN SPECIFIC PRODUCTION SECTORS
 - 2.1 Equipment for the production of iron, steel and non-ferrous metals
 - 2.2 Mining, construction and cement industry equipment
 - 2.3 Pulp and paper industry equipment
 - 2.4 Food and sugar processing equipment
 - 2.5 Equipment for the chemical, petrochemical and fertilizer industries
 - 2.6 Equipment for the textile industry
 - 2.7 Agricultural machinery
 - 2.8 Parts and accessories
3. ELECTRICAL EQUIPMENT
 - 3.1 Machinery for the generation of electric energy
 - 3.2 Transformers, switches and motors
 - 3.3 High-voltage insulators, bushings, etc.
 - 3.4 Telecommunication equipment
 - 3.5 Control and measurement equipment
 - 3.6 Electrical tools
 - 3.7 Electric furnaces, electrical cutting and welding equipment
 - 3.8 Other equipment
4. NON-SPECIFIC CAPITAL GOODS

The conclusions and recommendations arrived at in phases IA and IB were as follows:

- (a) From 1940, Mexican industry had displayed a sustained growth rate of more than 6.5 per cent and per capita growth of over 3.7 per cent. However, in this period the capital goods industry had only a very low share, of the order of 1.7 per cent of the GDP in 1967, in which context it is recalled that the GDP (at 1960 prices) rose from 87 billion pesos in 1950 to 150 billion pesos in 1960 and was more than 305 billion pesos in 1970.
- (b) An appreciable degree of industrial growth of all types was achieved, although it was always accompanied by a continuous deficit in the balance of payments, amounting to \$US 714 million in 1971 and \$US 853 million in 1972. This deficit was largely caused by growing imports of capital goods, components and intermediate products.

The industrial development achieved in this period was due to the strong impetus given by the Mexican Government and in particular to the fact that there was notable growth in private sector investments. The largest public sector investments were made for electricity generation, rising to 30 billion pesos out of a total investment of 87 billion pesos in 1971.

- (c) Foreign investments, for their part, were significant and reached an average of 2 billion pesos per annum during the period 1966-1971. However, remittances abroad in respect of profits and payments for technical services and royalties reached a value of \$US 80 million in 1968 (1 billion pesos) and a similar figure in 1969.
- (d) The overall share of industrial production grew to more than 33 per cent in 1970, the value of metal products being over 14.9 billion pesos in that year out of a total GDP of 305.8 billion pesos. Nevertheless, in general terms, Mexican manufacturing production concentrated on durable consumer goods throughout this period, with a slight increase in the manufacture of intermediate products and some rather unsophisticated capital goods, a trend which had been emerging since the 1960s.
- (e) From the 1960s onwards imports displayed a continuously diminishing trend in the consumer goods sector and to a smaller extent, although also in a sustained manner, as far as intermediate products were concerned. The capital goods sector, on the other hand, showed an inverse trend, imports rising substantially, including imports of parts and components. Exports of manufactures and semi-finished products, intermediate products and consumer goods, for their part, gradually increased, while capital goods accounted for an insignificant share.
- (f) Another important discovery resulting from the work carried out in this first phase of the joint project was that more than 80 enterprises for the manufacture of capital goods were firmly established in Mexico in 1970. These enterprises were concentrated in the metropolitan area of Mexico City, Guadalajara and Monterrey; there were also some production units in Queretaro, Veracruz and Puebla. All of these enterprises were then already producing a varied range of industrial equipment, sometimes with a certain degree of technological sophistication; but to a very preponderant extent production was focused on simple capital goods, generally with a high imported component, that is to say, a low national content. As was mentioned before, production was oriented principally towards satisfying a domestic market, but there was serious market distortion caused by the penetration of second-hand, i.e. used,

production equipment from the United States of America, which might have been cheaper but was technologically obsolete and in most cases had a short useful life.

- (g) Since the very beginning of the project, it was found that some enterprises had a low degree of capacity utilization and some of their manufacturing costs were considerably higher than those prevailing on the international market, especially in the case of branches or subsidiaries of transnational corporations. It was found that Mexican companies operating under licence or on the basis of foreign technology were subject to contractual restrictions with regard to their ability to export, owing to the licensing conditions granted.
- (h) The majority of enterprises either had no design capacity at all, or had a serious lack of such capacity, which prevented them from supplying certain equipment, since they had to obtain licences and designs from foreign suppliers, which proved to be inappropriate or very expensive.
- (i) The final conclusion was that the growth of the capital goods industry achieved up to that time had occurred spontaneously and with little coordination and that there was no precise policy to orient its development and objectives. Most of the capital goods enterprises had been established in response to the need for import substitution and owing to the protection given in some sectors to national manufacturers as compared with foreign suppliers.

The recommendations resulting from the conclusions of this first phase of the project were as follows:

- (a) For the purpose of its proper development it was necessary to channel substantial resources to the Mexican capital goods sector and to endeavour to ensure that domestic production would achieve competitive efficiency. It was also necessary to take the first steps for the gradual orientation of this industry not only towards the satisfaction of domestic markets but also to gradual supplementation of that activity through exports. That implied ensuring that the products of this industrial branch should reach a level of quality and technology that would adequately satisfy the needs of the country and those of the external market.
- (b) In order to carry out appropriate promotion of this industry, it would be necessary to prepare investment profiles and establish contacts with foreign manufacturers and local industrialists, as well as with investors, in order to interest them in establishing new plants in Mexico. In the case of most of the equipment identified, it would be necessary to make pre-investment studies in order to establish their potential for promotion purposes.
- (c) It was necessary to find mechanisms that would ensure proper utilization of the capacity existing in Mexico, especially when it would be possible to produce new equipment by expanding plants that had already been installed. Pre-investment proposals should be so prepared as to cover all of the aspects required, both technical and economic, and indicate possible export markets.
- (d) It was considered very important to adapt foreign investment policies to the needs of the capital goods industry, since that industry requires heavy investment; in the case of a sophisticated and complex technology it was suggested that relevant policies should be made flexible and liberalized so as to provide an inducement for foreign

investors. Although minority participation (between 30 and 49 per cent of capital) was appropriate, it was proposed that in some cases higher participation would be permitted as an exception so as to encourage potentially interested investors when it would be difficult to obtain technology and know-how under prevailing legal conditions. In such cases it was recommended that provision should be made to ensure that majority participation would be converted into minority participation after a certain period, especially in the event of future expansion of an enterprise.

- (e) Recommendations were also made on joint investments, technology agreements, the duration of agreements, the elimination of restrictive clauses regarding exports, patents and trade marks, appropriate selection of partners and technology, development of research capacity and technological services in Mexico and promoting the encouragement of local engineering enterprises to support growing industry.

The principal policy instruments used by the Government to support industrial development were also considered in this first phase and their efficiency and possible improvements were analysed in detail. The prevailing credit and financing policies of the country were analysed, as well as the significance and impact of the new funds created in that period to support industrial development. Both of these funds were created by Nacional Financiera, and it was considered that they could have a significant influence on the development of the capital goods industry. Both FOMIN and FONEI should define clearly their fields of action with regard to channelling investments for new capital goods plants.

Finally, various analytical studies were also made on fiscal incentive policies and some credit systems as well as some specific instruments such as the CEDIS, with regard to exports.

Thus, the first phase of the joint project covered in a practical form the objectives that had been outlined and laid the basis for the work on the subsequent phase of the project.

Phase II

This phase was launched in April 1973 and was planned to last four years until March 1977. Later it was extended to 1982, as will be explained below.

The work on this phase of the project was defined in the light of the results obtained during Phase I and as a continuation and supplementation of that phase.

Since the principal government sectors and in general other sectors of the country had identified the need for sustained growth of the industrial sector, the expansion of the capital goods sector was considered to be a priority aim. For this growth, it was necessary to expand the existing infrastructure and develop other support areas that would make possible rational expansion of the manufacturing sector. The capital goods project was therefore oriented towards the following objectives, which, as was indicated, were consistent with the results obtained in the previous phase of the project.

The significant results achieved in the previous phase made it possible to orient the growth of the capital goods industry, in the context of the central objective of formulating and evaluating technico-economic investment projects, towards branches for the construction of industrial machinery to serve as a basis for future promotion activities and decisions on investments in this branch.

In the period September 1973 to March 1974, preparations were made for the continuation of the study, and the following targets were fixed:

- (a) To prepare pre-investment studies for specific groups of products on the basis of the subsectors of capital goods selected;
- (b) To promote investments for the machinery branches selected, both for new projects and for the expansion of existing enterprises in Mexico;
- (c) To define patterns of investment and technological participation with reference to specific projects in terms of investments of foreign capital, costs of technology, contractual arrangements, etc;
- (d) To participate in preliminary and final negotiations regarding specific projects proposed, with the aim of preparing technico-economic evaluations in each case;
- (e) To update the projections of demand for and imports of capital goods for the period 1976-1980 and to estimate projections for the period 1981-1985 at 1974 prices;
- (f) To define new policies for supporting the production of machinery in general and for specific projects in particular.

In this phase of the project, a global strategy for the development of the capital goods industry was defined for the first time. It considered total demand and relevant projections, based on surveys of the main user sectors, the size of the market, its dynamism and the influence exerted on it by the public sector. Another important aspect of the strategy was to determine existing supply, its expected and required growth, considering technological, economic and commercial aspects and horizontal integration requirements. The strategy also included an evaluation of the situation on the international market for capital goods by analysing its future development according to various parameters and by analysing information on several very influential countries which affected the Mexican capital goods sector and would continue to do so in the future.

The result of the study of various branches under the project was that pre-investment studies could be prepared so as to promote and negotiate projects in the following areas:

1. Electrical equipment and machinery
 - (a) High-voltage transformers;
 - (b) High-voltage switches;
 - (c) Large-sized electric motors and generators (DC and AC);
 - (d) High-voltage porcelain insulators;
 - (e) Water turbines;
 - (f) High-pressure boilers for power plants.
2. Ordinary mechanical equipment
 - (a) Machine-tools;
 - (b) Diesel engines;
 - (c) Steam turbines;
 - (d) Pumps and compressors;
 - (e) Medium and heavy castings (3-15t in weight);
 - (f) Gears and speed-reducers.

3. Mechanical equipment for specific industries:

- (a) Textile machinery;
- (b) Machinery and equipment for the iron and steel industry;
- (c) Equipment for the chemical and petrochemical industries;
- (d) Equipment for the food industry;
- (e) Heavy mechanical equipment for the cement, pulp and paper, sugar and other industries.

Pre-investment studies were carried out by the UNIDO experts in 14 specific subsectors of the equipment selected, and one additional study was carried out by a sub-contractor. A number of specific studies were also made on the iron and steel industry, which were completed at the end of the first stage of Phase II.

When the studies had been completed, a number of investment promotion activities were carried out, which led to direct negotiations with potential foreign investors who were contacted directly in Mexico and also in specific missions carried out by project and Nacional Financiera personnel abroad.

Some of these promotion activities did not bear fruit, since negotiations for this type of project are sometimes extremely long and depend not only on technico-economic decisions but also on political considerations, which were outside the sphere of competence of the project personnel.

The methodology followed to carry out the project activities during this second phase can be divided into the following stages:

- (a) The preparation of pre-investment studies for specific types of machinery;
- (b) Investment promotion activities for the projects selected;
- (c) Negotiations regarding specific projects;
- (d) Technico-economic evaluation of specific projects and related proposals;
- (e) Updating of demand and import projections for the period 1976-1980 and preparation of estimates for the five-year period 1981-1985;
- (f) Consideration of general policy aspects related to the manufacture of capital goods in Mexico.

As was indicated earlier, the Phase II activities effectively began in the first quarter of 1974 and 14 pre-investment studies were made over a period of two years jointly by the UNIDO experts and the Nacional Financiera counterpart for the following specific branches:

- (a) High-pressure boilers for power stations;
- (b) Transformers;
- (c) Switches;
- (d) Electric motors and generators;
- (e) Porcelain insulators;
- (f) Machine-tools;
- (g) Pumps and compressors;
- (h) Diesel engines;
- (i) Foundries;

- (j) Production of gears and speed-reducers;
- (k) Chemical and petrochemical equipment;
- (l) Textile equipment;
- (m) Water turbines;
- (n) Equipment for the iron and steel industry.

In addition, a United Kingdom company carried out a pre-investment study on the manufacture of steam turbines on the basis of data obtained through the project.

In order to carry out the pre-investment studies it was necessary to organize working groups, which set out to conclude their tasks in short order, on the basis of a maximum duration of nine months for the longer studies. In many cases they managed to complete them in three months. These studies necessitated surveys of more than 70 national plants, some of which had already been visited in Phase I. The information required in this case related to the manufacture of specific products, so that the earlier visits were not duplicated but supplemented.

It is important to mention that the pre-investment studies carried out had the specific aim of analysing the market and the economic potential for the manufacture of equipment that had already been identified in sufficient detail to permit the effective promotion of investments in particular projects. The studies in question were not intended to serve as a basis for definitive investment decisions, since it was known - and the experience of the project later proved this - that substantial modifications had to be made in carrying out promotion work, because of counter-proposals by potential investors or owing to other factors deriving from the promotion work itself.

However, these studies were of substantial value since they made it possible to concretize investment proposals and carry on negotiations with entrepreneurial groups within a specific reference framework.

It is important to emphasize that the pre-investment studies were carried out systematically, with an attempt to standardize the methodology, and covered the following aspects:

- (a) Estimation of domestic demand projected for a minimum of five years;
- (b) Analysis of the manufacturing capacity required to satisfy the demand considered under (a) above;
- (c) Determination of the costs of domestic production and inputs;
- (d) Making recommendations on the technological capacity required either for new projects or for the expansion of existing plants;
- (e) Making an estimate of the capital investments required for the new projects;
- (f) Financial evaluation and evaluation of the direct and indirect benefits of the project.

As these were pre-investment studies, they did not include proposals for the location of the new plants, since location in zones outside the major urban concentrations was always considered (the so-called Zone III of the plans in force since that time).

Also, the methodology took into account a 20 per cent differential on costs of equipment from abroad. In carrying out the studies, more than 70 manufacturing enterprises were visited and surveyed, as has been mentioned, and also the

needs of the principal potential consumers were determined, especially those of the major consumers in the public sector.

As was also the case in Phase I, the project working group had to overcome many difficulties in order to obtain reliable information that would indicate the potential needs of the consumers, so that in some cases the data were estimates based on the needs of other countries and on the experience of the personnel participating in the project.

In this phase, the project had, as special support, the services of a group of project evaluators, who worked mainly on analysing the economic aspects of the projects.

When the investment promotion phase was reached, as mentioned above, it was found that some of the pre-investment studies had to be modified and adapted to the specific needs raised by potential investors, which implied additional work; however, that did not invalidate the results achieved previously.

As was established from Phase I onwards, the vast majority of the studies did not take into account export possibilities but only the satisfaction of potential domestic demand. However, in this phase, a specific study by ECLAC and Nacional Financiera for analysis of the potential Latin American market was indeed suggested. Later, it was concluded that it was more feasible to consider needs and possibilities for export to the United States and Canada, since these are potentially natural markets for products to be manufactured in Mexico.

The project personnel, together with the national counterpart, agreed firmly to base their work on the experience of many other countries which have promoted capital goods industries directed towards their domestic markets and have entered export markets only as they have obtained greater experience in the production of capital goods. This has been the general experience, except in the cases of Hong Kong and Singapore, where industrial development has been focused on satisfying export markets, following a political, economic and social approach that was very different from that of Mexico.

The work in Phase II also included an industrial promotion meeting at Vienna, at which representatives of the Ministry of Industry and Trade, Nacional Financiera S.A. and UNIDO met potential investors from various European countries.

At that meeting, 36 manufacturing enterprises in Europe showed interest and analysed the investment profiles prepared by the project team. On the basis of the explanations given by the Mexican representatives, the following concrete proposals were made by the manufacturers:

- In the case of high-voltage switches, three enterprises (from the Federal Republic of Germany, France and Switzerland) made offers;
- Four enterprises from France, the Federal Republic of Germany, Switzerland and Italy showed an interest in manufacturing different types of machine-tools in Mexico;
- An enterprise from the Federal Republic of Germany presented a letter of intent for the production of high-pressure boilers for thermal electric power plants;
- A Czechoslovak enterprise expressed its interest in expanding its installations in Mexico;
- There was a proposal for a joint investment project by a United Kingdom company and a company from the Federal Republic of Germany to manufacture steam turbines for industrial use;

- A United Kingdom enterprise showed interest in the manufacture of electric motors and relays;
- Other European enterprises presented proposals for the manufacture of equipment for the cement industry, diesel engines and industrial pumps.

Following the Vienna meeting, meetings and preliminary negotiations were held in the United States of America and Mexico with various manufacturers of equipment from the region for the local production of other equipment identified as viable, especially for the chemical, iron and steel and pulp and paper industries and for the food sector.

Finally, it should be noted that investment promotion proved to be relatively simple in this phase, while on the other hand negotiations for appropriate technology and the terms for its transfer proved to be extremely complicated tasks, in which it was difficult to reach a conclusion.

That was due not only to the conditions in which the foreign manufacturers displayed interest but also to the requirements of the principal consumers of the various types of capital goods in Mexico. For example, in the case of steam turbines, three offers were obtained from different suppliers with fully tested technology of world-wide reputation; however, the principal consumer in Mexico insisted on a particular technology, but the foreign manufacturer who owned the technology showed no interest in making investment; in Mexico.

Throughout this phase, co-operation between the UNIDO experts and the Nacional Financiera counterpart was very close and highly positive, and few difficulties in carrying out the work arose on that side. The greatest problem that had to be dealt with was that the time available was inadequate to cover the magnitude of the work and the multiplicity of possibilities in the field of the project. Accordingly, in 1977, the Mexican Government requested the United Nations Development Programme and UNIDO to extend Phase II, which it was decided would continue initially until 1979. For this stage of the project, it was decided to adopt a wider approach with the aim of expanding the contribution of the project to developing the capital goods industry in Mexico. The specific objectives for this expansion were as follows:

1. To work out in detail an integrated development strategy for the capital goods industry and the necessary machinery for that purpose;
2. To design the economic policy instruments required for promoting the development of local production of capital goods, such as: financing, the purchasing policy of the public sector, tariff protection, development of national engineering activities, fiscal incentives and export promotion;
3. Continuing to work out profiles and pre-feasibility studies in specific fields of capital goods production, as preliminary instruments for their promotion;
4. To intensify promotion for the establishment of new capital goods manufacturing plants or the expansion or modernization of existing enterprises;
5. To encourage the training of personnel at the various levels required by industry;
6. To organize a technical information system for the capital goods sector;
7. To develop the technological support infrastructure for the capital goods industry.

With this new approach, the project concentrated its activities on proposing an entire system in order to establish an institutional framework for the development of the capital goods industry in Mexico.

The first task that was carried out according to this new approach was the preparation of study entitled: "A Strategy for Developing the Capital Goods Industry in Mexico".

This study served as a basis for implementing a package of economic policy instruments intended to promote the capital goods industry. In this study, recommendations were made for the first time to support the capital goods industry with regard to the following aspects:

1. Financial support;
2. Fiscal incentives;
3. Purchases by the public sector;
4. Tariff policy;
5. Technological support and development.

To supplement this study and with the aim of disseminating and analysing its results, a high-level seminar was held with the participation and under the auspices of the Ministries for National Property and Industrial Development, Programming and Budget, and of Nacional Financiera itself, and with the collaboration of the CECADE/UNDP training project. With the support of the sponsors of the seminar, a programme of training on capital goods was also carried out; 49 officials from the public sector participated, who in one way or another were doing work connected directly or indirectly with the development of the capital goods industry.

Under another of the project activities, direct co-operation was established with the Mexican Petroleum Institute, which did work on an analysis of Mexican engineering capacity for the production of capital goods, especially goods required by the petroleum and petrochemical sector, and on various profiles of capital goods in demand by the petroleum industry.

As a support tool for industrial promotion, an Information Centre specializing in capital goods was established by NAFIN, with the purpose of compiling, organizing, processing and disseminating technical and economic information on capital goods for the benefit of enterprises and agencies carrying on standardization and promotional activities in this field. This Centre collaborated from its establishment in designing additional projects within a macro-economic reference framework as well as in seeking to channel investments towards priority areas, but did not consider isolated projects whose impact on the economy as a whole had not been visualized earlier.

In this phase of the project, 37 profiles were worked out for promoting investment projects that would enable Mexico to manufacture the basic heavy equipment required by the users of capital goods in the priority sectors. The investment involved to carry out the principal projects was estimated at \$US 800 million at 1978 prices, and it was calculated that these projects could generate some 24 000 new jobs and annual import substitution of the order of 18 billion 1978 pesos.

Thanks to the approach selected for the extension of Phase II it was possible to consider professional electronics formally for the first time as an area of interest within the capital goods sector. Although this field does not generate major investment, it does generate employment and is also of very great importance, being one of the peak technologies which could give appropriate impetus to this sector and to Mexican industry in general.

The programme of work for this extension of the project also included launching a monthly publication of technical information on capital goods which would be prepared on the basis of information from both national and international sources on technical aspects of relevance to the subject.

Some of these studies were published as monographs covering the following aspects of capital goods:

1. National supply of capital goods;
2. National supply in the boiler-making sector;
3. National supply of castings;
4. National supply of compressors;
5. National supply of pumps;
6. Machinery for the food industry;
7. Professional electronics;
8. Agricultural machinery;
9. The international trend in machine-tool technology;
10. Demand for capital goods in the basic petroleum and petrochemical industries;
11. Demand for capital goods in electricity generation and distribution;
12. Demand for capital goods in the iron and steel industry;
13. Demand for capital goods in mining;
14. Demand for capital goods in the cement industry;
15. Demand for capital goods in the pulp and paper industries;
16. Immediate programme of action on capital goods;
17. Effects of the origin of engineering in the development of the capital goods industry in Mexico;
18. Application of technical forecasting to investment evaluation.

During this period formal negotiations for various projects took concrete shape for the first time and were carried out in both national and foreign enterprises. The projects prepared under the programme on which negotiations took place were as follows: steam turbines, turbo-generators and water turbines.

In March 1979, the first tripartite review meeting was held between UNDP, UNIDO and Nacional Financiera. This meeting served to evaluate the activities carried out under the project up to that date and to determine the lines of action for continuation of the project.

The meeting was held at Mexico City during two weeks in March 1979; representatives of the three parties involved took part together with the joint management of the project. At the meeting, each of the activities was reviewed and meetings were later held with government authorities and representatives of industry, chambers of industry and the main consumers of capital goods for the purpose of ascertaining their opinion on the approach and results of the joint project.

The evaluation carried out by the tripartite group also included an analysis of the methodology adopted in the project and a comparison of experience with countries at a similar stage of development as Mexico.

One of the conclusions of the evaluation mission was that the government authorities considered it extremely important to continue the activities of the joint NAFIN/UNIDO project in subsequent years with the aim of completing promotional activities, developing specific important projects, discussing information, and training manpower, naturally in collaboration with the relevant government authorities. For that reason, the evaluation mission insisted on the need to give maximum support to the project so that it would not only continue but also intensify its activities. The need was also indicated to make a study in greater depth on economic policy instruments and the possibility of adapting the strategies outlined to the new conditions created by rapid economic development, which was foreseen at the time.

The second phase was further prolonged until 1982, in which period all of the studies envisaged were completed and intensive promotion activity was carried out, leading to several investments.

Table 4

PRINCIPAL ENTERPRISES SET UP FOLLOWING THE STUDIES CARRIED OUT
IN THE JOINT NAFINSA/UNIDO CAPITAL GOODS PROJECT

Enterprise	Products	Partners	Investment \$US million	Jobs
Grupo Industrial NKS, S.A. de C.V. Established in Sep. 1980	Foundry, forging	NAFIN, Sidermex and Kobe Steel (and other Japa- nese companies)	350	2 000
Productora Mexicana de Tubería Established in Nov. 1980	Large-diameter steel pipes for gas and oil pipe- lines, 400 000 tons/year	NAFIN, Sidermex and Sumitomo (Japan)	130	1 000
Turalmex S.A. Established in July 1980	Steam turbines and generators up to 80 kW, machines and generators for water and other turbines and other equipment	NAFIN	30	412
Turbinas y Equipos Industriales, S.A. de C.V. Established in July 1981	Water turbines	NAFIN and Sulzer Wyss (Switzerland)	15	300
Compañía de manufactu- ras Metálicas Pesadas, S.A. de C.V. Established in May 1979	Heavy boiler-making	NAFIN	10	400
KSB Mexicana, S.A.	Pumps	KSB (Fed. Rep. of Germany), private investors	5	150
Interruptores de México, S.A. (IMEX) Established in July 1977	High-voltage switches	Siemens (FRG)	15	250

Phase III

The third phase of the project commenced at the beginning of 1982 and was planned to last five years, until December 1986. Its commencement coincided with the change in the country's economic situation and with a change in the public administration. That made it necessary to reorient the project activities, since the plans for growth had to be reconsidered and in some cases even cancelled, owing to the notable deterioration in the economy.

Unlike other six-year cycles, the beginning of the current period coincided with the worst balance-of-payments crisis in Mexican history.

Since the beginning of 1983 there has been a policy of austerity in public spending and as a result a restriction on new investments. Also, the peso underwent two large-scale devaluations in that year, but above all the scarcity of foreign exchange became acute in this period and unprecedented exchange control was established.

The annual growth rates of the Mexican economy fell from the level of between 8 and 9 per cent that had prevailed immediately beforehand to an estimated 1 per cent in 1982 and zero or even negative growth in 1983, followed by the onset of a slight recovery, which again disappeared in 1986, after which the crisis became intensified and reached levels similar to those of 1982.

In this situation, capital goods became a more pressing priority for the country since many of the problems quoted would be solved if greater production capacity were available. However, resources for investment, especially foreign exchange, dwindled and even disappeared.

All of these events had a strong influence on the design and later implementation of the project. Activities related to new programmes were substantially reduced; however, studies and negotiations continued on some of the investment projects that were considered to be of great importance for the country.

Against this national background, the principal objectives of this phase were outlined as follows:

1. To provide data that could serve as a basis for updating the national development strategy for capital goods in the short and long term, both in its overall aspects and in specific sectoral aspects;
2. To clarify crucial aspects related to the development of the industry and to urgent problems connected with the economic situation through which the country was passing;
3. To contribute to the consolidation of projects already worked out in the previous phases, by means of assistance in research, development and marketing techniques;
4. To collaborate in establishing machinery for both new and current economic policies with regard to the capital goods sector;
5. To analyse the relationship with the Mexican capital goods industry of certain industrial sectors that are consumers of equipment and if possible to promote new projects for selected equipment.

Various activities were planned for the attainment of the objectives indicated, and were to be completed by the end of 1986.

The work plan that was approved and is now being completed for this phase of the project was:

1. Preparation of a document regarding the current situation of capital goods in Mexico. The objective of this document is to update and

adapt the information of the first project publication of 1977 to the strategy for the development of the national capital goods industry.

2. Advisory and dissemination work linked to the above activity. Conferences, talks, seminars and other publicity and analytical activities were planned in order to improve knowledge and understanding of the current capital goods situation and its prospects, so that there should be awareness in sectors related to capital goods of the results of the work carried out under the project and so as to permit feedback of their suggestions and additional information regarding the Mexican and world capital goods industries.
3. A study on the boiler-making industry in Mexico. This study included an analysis of the development achieved by the industry up to 1984, its current problems and prospects. The results were published in 1985 as a sectoral monograph and a number of supplementary seminars were arranged in order to disseminate the results among industrialists and chambers of industry, so as also to obtain feedback on the acceptance of the study by the Mexican industrial sector.
4. A monograph on the professional electronics industry in Mexico. In the previous phase of the project, electronics was identified as a promising area within the capital goods industry.

In 1982, a first monograph was published on the prospects for this industry in Mexico. Later, this subsector was recognized as having priority by Nacional Financiera. Accordingly, it was decided to pursue the subject in depth since the greatest progress and technological change is found in this industry; in addition, its products require low monetary investment but generate very high value added. This work is in preparation and will be concluded before the end of the project.

5. A study on turbines. Initially, a study on the feasibility of producing steam or gas turbines in Mexico was envisaged in the work plan. Owing to the economic crisis, it was found that the viability of such a project was currently zero so that it was decided to carry out a study on the situation of turbines at world level, analysing the predominant types of turbines installed within the petroleum and electricity generation industries as well as the most important technologies in this field. It was considered that this study would provide more information on such equipment and would thus later make it possible to analyse the type of turbines that it was most desirable to manufacture in Mexico when economic conditions were favourable.

In the course of this work it was found that it would be advisable to install a repair workshop for thermal turbines (steam and gas turbines) to meet the needs of the Federal Electricity Commission and Pemex, since they now have to send abroad for repair a large number of the turbines installed in their various plants. Thus, a specific study was carried out to supplement the work on turbines in general, which was completed and is being promoted by Nacional Financiera among possible investors and a number of existing workshops that already carry out some repairs in Mexico.

6. A study on the capital goods requirements of the Mexican mining and metallurgical industry. Originally an analysis of the possibilities of manufacturing equipment required in the Mexican iron and steel industry was envisaged, since that industry had major expansion plans up to 1982.

Owing to the critical economic situation through which the country was passing, the development plans of the iron and steel industry were considerably slashed and some of the expansion contemplated was even cancelled. For that reason it was decided to reorient the original objectives of the work, and the possibility is now being analysed of manufacturing some capital goods for the mining and metallurgical industry in general, in view of the large quantity of equipment that is continuously required for the operation of various plants, some of which still have to be imported because there is no national manufacture.

This study is in hand at the moment and will be completed by the end of the third phase of the project.

7. Study on equipment required by the food industries. The food industry requires a large quantity of equipment, most of which falls within the specialized boiler-making subsector and to a very large extent is not manufactured in Mexico, because specific designs and special materials such as stainless steels are required. In the third phase it was decided to include a study on the possibilities of manufacturing equipment for this sector, which is of vital importance to the country. However, to carry it out and in view of the limitation of financial resources, an attempt was made to obtain additional support from a country that would send experts to carry out the study. Unfortunately, that support did not materialize, with the result that this activity was recently cancelled at the tripartite meeting held in June 1986.
8. A study on the development of engineering enterprises in Mexico. From Phase I of the project onwards, the need to have engineering enterprises to support manufacturers of capital goods was indicated. Mexico already has various engineering enterprises which provide services for the realization of industrial projects and in some cases to support manufacturers of specific equipment. However, greater development is required in this field, since the capital goods industry cannot yet provide such services itself and thus achieve technological independence; the manufacturers of equipment still depend to a great extent on designs purchased from abroad or provided under agreements with foreign equipment manufacturers.

For that reason, a study was planned that would help to ascertain the current situation with regard to engineering enterprises in Mexico, so that mechanisms could be proposed for the development of such enterprises, thus making it possible to consolidate the technological and design capacity of capital goods manufacturers in Mexico.

9. A study on economic policy. The purpose of this activity is to analyse all of the mechanisms and policies existing in Mexico to support the manufacture of capital goods and the development of manufacturing plants in the sector. The study will be completed by the end of this phase of the project and will include an analysis of the situation regarding current policies in Mexico and a proposal for new mechanisms for improving the development of the Mexican capital goods industry.
10. Studies on economic policy on capital goods in the Republic of Korea. As a new feature of the project, it was decided in this phase to carry out comparative studies regarding the situation of the capital goods industry in other countries so as to ascertain their development and the experience that was accumulated when approaches different from those followed by Mexican industry were adopted. The specific case of the Republic of Korea was considered in this activity, and a monograph

on the industrial and development policy of that country was published in 1985.

11. A study on the capital goods industry and related promotion policy in Brazil. The purpose of this study, like the preceding one, was to obtain information on the development of the Brazilian capital goods industry that would permit a comparison with those of Korea and Mexico and would yield conclusions and data on the basis of which recommendations could be formulated for reorienting the development policy of the Mexican capital goods industry.
12. A seminar on the capital goods industry. To supplement the studies enumerated above, it was decided to promote jointly with the Ministry of Commerce and Industrial Development and the Chambers of Industry in the branch a high-level forum on the capital goods industry for the purpose of analysing experience obtained in specific manufacturing branches and in various countries.

Since the project has not the necessary funds to arrange this forum, UNIDO has been requested, through the Ministry of Commerce and Industrial Development, to give special assistance for carrying it out. Action is in hand for that purpose and it is hoped to arrange the forum before the end of this phase of the project or at the beginning of 1987.

13. Supplementary support activities for the project, such as the organization of a project formulation and evaluation seminar, which was carried out within Nacional Financiera with the participation of 20 analysts from the institution. This course was given by international UNIDO experts, who trained the counterpart personnel in these activities, using computerized systems developed by the UNIDO Feasibility Studies Section, Vienna.

Within these various activities, the possibility was also envisaged of organizing a seminar on the development of industrial ports, taking as a model the development of the Mexican Port of Lázaro Cárdenas, which has plants manufacturing capital goods such as those that were installed as a result of work carried out in previous phases of this project.

HUMAN RESOURCES

UNIDO's principal contribution to the implementation of the project from its commencement in 1971 has been to arrange for the participation of experts in the various areas of capital goods. Thus, the joint project has had the collaboration of a total of 70 international experts.

Nacional Financiera has assigned a total of 95 professional staff and 25 support staff since the beginning of the project to assist and supplement the above staff and in many cases to receive training and acquire knowledge in the capital goods branch.

At all stages of the project, the UNIDO team of experts and the counterpart personnel were organized under the direction of joint managers, one from NAFIN and one from UNIDO, who managed and supervised all of the activities in a co-ordinated manner.

In Phase IA, the team consisted of five UNIDO experts and three Nacional Financiera experts. The UNIDO expert staff consisted of:

- One specialist on technical and manufacturing aspects, who also acted as co-ordinator of the working group;
- One expert on industrial engineering;
- One expert on industrial policy;
- Two experts on marketing techniques, imports and exports.

Initially, the NAFIN staff consisted of two economists, one of whom acted as co-ordinator, and one mechanical engineer.

As can be seen, the project team was small in Phase IA, consisting of only eight persons. As was indicated in the section that describes the work of this phase, the reason was that preliminary activities were undertaken first in order to identify what capital goods were desirable for the development of the country. Consequently, the group was not large to begin with and increased in size progressively whenever a broader picture of the capital goods sector emerged and it was seen what subsectors and products could be of interest both to Nacional Financiera and to the country as a whole.

In Phase IB the UNIDO Group of Experts consisted of five persons:

- The team leader, who was an expert on industrial policy;
- One market analyst;
- One industrial engineer specializing in processing equipment;
- One industrial engineer specializing in machine-tools;
- One electrical engineer specializing in electrical equipment.

The Nacional Financiera team increased in the second part of Phase I and consisted of two high-level staff who worked part-time, and five persons working full-time. The part-time staff were economists and the full-time staff comprised four professional economists and one engineer.

As has been indicated earlier, the results of Phase I laid the basis for expanding the Phase II objectives; although the UNDP programmes were postponed and in some cases cancelled between the end of Phase I and the actual beginning of Phase II, a strong boost was given to the project at the beginning of the latter phase, and several experts collaborated in the work, some full-time and others for short periods, as was required in each of the activities.

Between 1974 and 1976, 16 UNIDO experts took part in the project, collaborating in the following special fields:

- One project manager and adviser on economic policy;
- One planning specialist;
- Two project evaluation specialists;
- One expert on diesel engines;
- One expert on machine-tools;
- One expert on pumps and compressors;
- One expert on castings;
- One expert on gears and forgings;
- One expert on steam generators;
- One expert on electrical insulators;
- One expert on electrical equipment such as transformers, switches, electric motors and generators;
- One expert on market analysis;
- One expert on chemical equipment;
- One expert on iron and steel industry equipment;
- One expert on water turbines.

On the Nacional Financiera side, a total of 18 persons took part in the project, 4 working part-time and 14 full-time.

It should be pointed out that the part-time staff included very high-level members of the institution, including the Deputy Director and the General Manager of the enterprise in office at the time.

The specialities of the staff collaborating in this phase, on the Nacional Financiera side, were as follows:

- Seven economists, two of whom were the management staff mentioned, working part-time;
- Three economists working full-time, although for short periods, who were also assigned to other work within the institution;
- One chemical engineer;
- Three electrical engineers;
- Five mechanical engineers;
- One petroleum engineer, assigned by Petróleos Mexicanos to collaborate on work related to capital goods of interest to his enterprise.

As from 1977, promotion activities and the development of specific projects were intensified for various selected types of capital goods. Nacional Financiera increased the number of its staff, assigning to the project 12 full-time economists and 20 engineers in various specialities; 2 engineers were assigned by SICARTSA to collaborate in the project as well. Also, a strong administrative support group was incorporated, and some non-professional employees worked on tasks related to information systems and various surveys carried out for the project.

In the continuation of Phase II, the project had the services of a joint project manager, who was later transferred to another section of UNIDO, being

replaced by one of the experts, who assumed the joint managership until the end of this phase. The specialities of the experts who collaborated in the period in question were as follows:

- Three experts on heavy mechanical equipment;
- One expert on machine-tools;
- One expert on professional electronics;
- Eleven experts on economic policy instruments;
- One expert on transport equipment;
- One expert on mining equipment;
- One expert on equipment for the food industry.

For the first time within the project, the services of so-called "associate experts" were used in this phase. They were provided by Governments of European countries and it was their function to work as assistants, since they had not yet sufficient experience to collaborate as experts in any specific field. The advantage of these experts is that they are assigned to the project free of any charge whatsoever, their expenses being covered through fellowships by the Governments of their countries of origin.

Finally it should be mentioned that in this phase, the project had the collaboration of:

- One expert on small- and medium-sized industry;
- One expert on the petrochemical industry;
- One expert on equipment for the ferrous and non-ferrous metallurgical industry.

In this phase, Nacional Financiera assigned a total of 22 professionals, 4 of whom were economists, including the joint manager, who worked part-time, 17 engineers in various specialities, and one lawyer. The latter's work on aspects of a legal nature was of the greatest value in various projects. The project also had a strong administrative support group and 9 secretaries for typing, filing and other office duties.

Nacional Financiera also assigned part-time support staff from other areas of the enterprise, consisting of a technical and information support unit, an economic research unit on industry projections and balance-of-payments questions, the Food Industry Section, the Chemical and Petrochemical Industry Section and the Special Projects Section.

As was mentioned in the description of the activities carried out in each phase, the Information Centre on Capital Goods was set up in 1977 and was staffed by an economist, an engineer, a specialist in library science, two assistant analysts, secretariat support staff and messengers.

At the express request of the Ministry of Finance and Public Credit, the project group participated in work related to the industrial development of the frontier zones of the country, and a team consisting of three part-time staff and eight full-time staff was assigned for that purpose. This team was made up of four engineers, three economists, one of whom acted as team co-ordinator, and a law graduate. The team also had two administrative support staff.

The Federal Electricity Commission for its part assigned a team consisting of five engineers, who worked part-time on a specific project of interest to that institution.

In the third phase of the project, corresponding to the period from January 1983 to the end of 1986, UNIDO assigned the following staff, by speciality:

- One project manager, who was an expert on electro-mechanical engineering and worked on the project up to October 1984;
- One project manager, from April 1985, who was an expert on project development and electro-mechanical engineering;
- Four international experts, whose specialities were the economic policy of the Republic of Korea, electronics, machinery for the mining and metallurgical industry, and electrical equipment.

In this phase of the project the procedure adopted was to enlist the participation of a number of national experts, on the one hand making possible substantial savings, since resources were limited in this final phase, and on the other hand using the experience obtained by national professionals over the years in the capital goods sector. The national experts who have collaborated in the project to date are:

- The national project manager;
- One expert on turbines;
- One expert on mechanical engineering;
- One expert on planning and electronic equipment;
- One expert on statistics;
- One expert on mining and iron and steel equipment;
- One expert on the electronics industry;
- One expert on the metal-mechanical industry.

In this latter phase of the project, maximum use was made of associate experts, who, as has been pointed out, are provided by Governments of European countries without any charge to the project itself. Under this procedure, three experts were provided by the Italian Government. Their specialities were:

- Mechanical engineering;
- Economics; and
- Electronic engineering.

A Netherlands economics expert also participated, and later the project will have the services of three experts from the Federal Republic of Germany, specializing in information and computerization, economics and mechanical engineering.

In this last stage, Nacional Financiera reorganized its participation in the joint project activities and created a specific unit for permanent collaboration with the UNIDO experts, without taking staff from other areas of the enterprise. Owing to the economic situation and prevalent restrictions in the country, this unit consists of only four economists and four administrative support staff. However, at various stages of the work, interdepartmental groups have been formed and have collaborated part-time on specific project tasks. As many as 20 persons have participated in this work, grouped in units of four or five professionals for specific tasks, such as studies on the possibility of manufacturing food-packaging machinery or analysing the feasibility of manufacturing integrated circuits and semiconductors.

With regard to the UNIDO team that participated throughout the project, it is important to mention the origin of the experts, which shows that an attempt was made to obtain appropriate experts irrespective of their nationality. The 70

experts who participated from the beginning of this project came from the following countries:

- Argentina;
- Austria;
- Belgium;
- Bolivia;
- Chile;
- Colombia;
- Czechoslovakia;
- Egypt;
- Federal Republic of Germany;
- France;
- Hungary;
- Israel;
- Italy;
- India;
- Mexico;
- Netherlands;
- Peru;
- Poland;
- Republic of Korea;
- Sweden;
- United Kingdom;
- United States of America;
- Uruguay.

The countries that assigned the largest numbers of experts were:

- Mexico, with nine (considering that in the last phase it was decided to use the maximum number of national experts);
- Chile, with seven;
- United Kingdom, with eight;
- Federal Republic of Germany, with seven.

As far as associate experts are concerned, the countries that made the greatest contributions were:

- Federal Republic of Germany, with four;
- Italy, with three;
- The Netherlands, with two.

Finally, it is important to mention that at some stages the project also had the collaboration of staff from other institutions, such as the National Council for Science and Technology, some of the subsidiaries of Nacional Financiera, the Ministries of Industry and Commerce, Commerce and Industrial Development,

National Property and Industrial Development, Energy, Mines and Quasi-governmental Industry, as well as technicians from the Federal Electricity Commission and Pemex, as mentioned above.

Thus, the Joint Capital Goods Project enjoyed the direct participation of more than 250 persons during the three phases into which it was divided; its scope transcended that of formal counterpart activity and it had an impact on, and the collaboration of, other institutions for the benefit of the country.

FINANCIAL RESOURCES

In its first phase, the joint project received a UNDP contribution of \$US 1 003 964, which was disbursed as follows:

	<u>\$US</u>
1972	21 599
1973	65 158
1974	202 963
1975	242 265
1976	133 260
1977	337 279
1978	1 440

The appropriation for the last year was an unspent balance that was actually used in the second phase.

In the first phase, the contribution by the Mexican Government through Nacional Financiera was 4 500 000 pesos; this was a contribution in kind to cover the office expenditure of the staff assigned by NAFIN to the project, other expenditure on furniture and equipment and also some travel within the country.

In the second phase, UNDP allotted a sum of \$US 2 020 000 for the implementation of the project, and the Nacional Financiera contribution was 77 600 000 pesos, which served to defray the staff and administrative costs of the project (contribution in kind).

However, in a review carried out at the beginning of the project in 1977, the UNDP contribution was reduced by \$US 94 750, cutting the contribution of the United Nations system to \$US 1 925 250.

With the introduction of new policies in the United Nations system, a cost-sharing contribution was requested from the national counterpart and was fixed at \$US 60 000, to supplement the total project budget.

This contribution was requested in conformity with the guidelines specified in the UNDP Policies and Procedures Manual regarding contributions to projects by national Governments (sections 4410-4430); based on resolution 1240 of the thirteenth session of the General Assembly and the Standard Basic Agreements with Governments participating in the system. This type of participation was established as a contribution by the countries receiving United Nations services and as a commitment payable in the convertible currency costs component. However, the contribution should not exceed 30 per cent of the total cost of the project; therefore, the first contribution of Nacional Financiera was fixed at the amount mentioned above.

Under the third phase of the project, a budget of approximately \$US 1 million was requested and was authorized initially. However, owing to the financial problems experienced by UNDP from 1982, there had to be a general cut of up to some 45 per cent in all projects financed by this Programme, so that the contribution for this project became only about \$US 550 000, distributed initially as follows:

	<u>\$US</u>
1982	160 205
1983	82 059
1984	89 829
1985	42 812
1986	184 500

In this latter phase, Nacional Financiera budgeted for and assigned to the project up to 1985 a contribution in kind of 153 284 300 pesos, distributed as follows:

	<u>pesos</u>
1982	27 579 000
1983	33 200 000
1984	44 243 000
1985	48 262 300

Also, in 1984 Nacional Financiera assigned to UNDP an additional cost-sharing contribution of \$US 60 000, which could not be paid until August 1985 owing to the financial difficulties being experienced by the country. It was decided that this contribution would be used for the 1986 budget. Therefore, the dollar budget of the project for that year, making the UNDP/UNIDO administrative adjustments, became \$US 237 777.

Table 5 shows the breakdown of the budgets for the three phases of the project and the application of the resources assigned to the project by UNDP/UNIDO.

As can be seen, the largest percentage of the funds was used for the recruitment of experts, who worked during the three phases on the special tasks referred to in the section describing activities. The other items consisted principally of support expenses related to the activities of these experts. It can be seen that 86.8 per cent of the total dollar budget for Phase I went to recruiting foreign experts, while only 0.8 per cent went to equipment and 0.65 per cent to training activities. Although this seems to be a contradiction, it is not really so, since the objective of training national counterpart personnel was carried out intensively by the experts who came to work on the project.

Thus, in Phase II it can be seen that 78.5 per cent of the budget was used for recruiting international experts and for the first time a small quantity, 0.2 per cent, for recruiting national experts. In Phase II also, sub-contracting work was carried out for the first time and represented 11.5 per cent of the total budget; that amount was used for specific studies, as indicated in the section describing project activities. Approximately 1 per cent of the budget was used for the procurement of various items of equipment and for the first time some 2 per cent was used for specific support activities; in concrete terms, this increased the international experts component by the inclusion of support personnel, principally from the Vienna Headquarters.

In the third phase, a total of \$US 612 000 was allocated to the project; this is the smallest sum to be made available since the beginning of the project and reflects current restrictions and the critical world economic situation. In any case, the budget was optimized and at that stage also 69.3 per cent was assigned for the recruitment of international experts and 21.8 per cent for obtaining the services of national experts; as a result, the recruitment of experts also predominated in this phase, with 81.1 per cent of the budget.

Training absorbed 2.2 per cent of the resources and sub-contracts 3.3 per cent. The amount used for equipment was 1.9 per cent of the total budget.

To sum up, it can be noted that out of a total of \$US 3 493 063.70 contributed to the project by UNDP since the beginning of Phase I, more than 80 per cent was used throughout the period for recruiting experts and for purchasing equipment; although the latter did not represent a significant percentage by value, it was indeed of great benefit to the project, comprising various types of office equipment such as calculators, photocopiers and dictaphones, as well as two automobiles. All of these purchases were highly beneficial to the project. Finally it is important to indicate that in this last phase the project also purchased a microcomputer for various data-processing tasks. The equipment purchased in previous phases had already been passed on to the counterpart and the microcomputer will be handed over at the end of the project in December 1986.

Table 5

BREAKDOWN OF BUDGETARY UTILIZATION OF UNDP CONTRIBUTIONS TO THE
JOINT NAFIN /UNIDO CAPITAL GOODS PROJECT

	Phase I	Phase II	Phase III
Experts	871 306.00	1 513 215.41	423 927.00
Support	-	38 493.08	-
Travel	5 456.00	45 025.26	30 953.00
Mission costs	9 398.00	16 715.35	6 968.00
National experts	-	3 750.00	133 846.00
Training	6 541.00	22 817.55	13 221.00
Sub-contracts	-	222 625.00	20 000.00
Equipment	8 029.00	19 679.60	11 380.00
Miscellaneous	20 326.00	63 852.39	24 288.00
Total	\$US 1 003 964.00	1 925 250.00	559 405.00
NAFIN	\$Mex 4 500 000.00	77 600 000.00	153 284 300.00
Totals UNDP/UNIDO	\$US 3 493 063.70		\$Mex - - -
NAFIN	\$US 60 000.00		235 384 300.00
	\$US 3 553 063.70		\$Mex 235 384 300.00

OUTPUTS

The joint capital goods project between Nacional Financiera and the United Nations Industrial Development Organization produced a number of outputs, many of which can easily be quantified, though in other cases it is difficult to define a specific value.

In 1979 a tripartite group from the Mexican Government, UNIDO and UNDP carried out a first formal evaluation, the principal conclusions of which deserve attention, since they reflect the feeling of the parties involved in the project and also the consensus that was obtained on the Mexican side, both official and private, regarding the contributions of the working group up to that time. The institutions consulted were Pemex, CFE, Sidermex, Canacintra and a number of private enterprises.

Owing to the form of interaction between Nacional Financiera and the official departments and the way in which that body encouraged the studies on the capital goods industry, it was considered that the joint project was a model for use in the provision of technical assistance to other developing countries that selected a similar methodology for encouraging the capital goods industry.

From that time onwards, this pattern was promoted vigorously in UNIDO, and at present various capital goods projects already exist in Venezuela, Colombia, Bolivia, Tunisia and Algeria, which have to a large extent been modelled on the Mexican project.

A. Achievements:

The project achievements can be divided into two groups, namely: (a) those related to strategic aspects of industrial development in Mexico and specific executive action, and (b) projects and concrete effects in national industry.

Among the achievements in the first group the following can be mentioned:

1. A contribution to arousing national awareness regarding the importance of capital goods, which had neither been identified nor integrated as a strategic part of Mexican economic development. The concrete contribution of the project in this respect comprised the establishment of priorities, the design, implementation and adaptation of development strategies for industry in the macro-economic framework, the study and preparation of projects within that framework, the issue of publications for general distribution and many sectoral studies intended for checking the constituent parts for consistency and making such adjustments as might be necessary from time to time.
2. The establishment of a comprehensive development strategy for the capital goods sector in Mexico. Through the publication of a strategy for the sector that set programming guidelines, and through studies of demand by subsectors, including details of equipment (broken down into their principal components in many cases), analysis of the production capacity of national industry, promotion mechanisms and support policies, the project contributed to the allocation of resources by the various government agencies and groups of industrialists, which later materialized in specific projects.
3. A working methodology has been consolidated for the establishment of such a comprehensive strategy, although the strategy has varied with each government administration, owing to the different approaches adopted and the changing economic and political situation of the country. This result is highly important, since a methodology is most necessary for this industry because capital goods projects take a long

time to mature and it is a well-known fact that obstacles and difficulties are always encountered during that period. The excellent relationship between Nacional Financiera and other government agencies played a very important part in consolidating this methodology and in achieving great capacity for implementing capital goods projects throughout the 15 years covered by the three phases of joint work with UNIDO.

4. Thanks to the close collaboration established with Nacional Financiera and other institutions both in the public and in the private sectors a strategy has been designed that has been updated and reoriented when necessary following changes in the public administration and in the economic situation of the country. Therefore, the strategy covers the development of the capital goods industry in both the long and the short term.

The concrete results obtained within the capital goods industry were as follows:

1. Implementation of a dozen projects overlapping the periods of office of successive Governments, and reaching an investment level of more than \$US 1 billion in their first stages. Table 4 (page 25) gives an account of the projects in which Nacional Financiera has participated directly from the very beginning and in some of which it is still a partner. Other projects can also be mentioned in which Nacional Financiera did not participate as a shareholder but that materialized on the basis of the joint project studies; inter alia there was the establishment of Makrotec, S.A. de C.V. and Fabricaciones Metálicas Pesadas, S.A., heavy boiler-making enterprises located in Monterrey, N.L. In the electrical engineering field, mention can also be made of the establishment of Megatek, S.A. de C.V. and the expansion of Industrias IEM, S.A. de C.V. for the manufacture of UHP (ultra high power) transformers, which materialized on the basis of the research and studies carried out under the NAFIN/UNIDO joint project.
2. The above-mentioned projects include the manufacture of the following types of equipment:
 - (a) Heavy components and parts of large size or weight, fundamentally for the construction of machinery and heavy equipment, for which adequate production capacity was not available. These were in particular large forgings and heavy castings as well as complete heavy boiler-making parts for equipment. This range of products makes possible a considerable leap forward in production capacity for nuclear, iron and steel, chemical, shipbuilding and railway equipment, etc.
 - (b) Turbines and large generators for which there was no production capacity in Mexico; this makes possible a considerable change in national supplies of equipment for electricity generation and petroleum production and parallel requirements of other heavy industries. Keeping Mexico abreast of advanced technology trends in the world with regard to the critically important and rapidly expanding area of prime movers is a most significant activity, and its effects can be felt with regard to both the technological requirements of the products and the modern materials used in their manufacture.
 - (c) Motors and engines in large and other sizes that were not produced earlier for a major group of user industries (railway, shipbuilding and metallurgy, etc.).

- (d) Basic equipment in widespread use but of different power and size or characteristics from previous production. Large flow pumps, multistage high pressure pumps, etc.
 - (e) Specialized machinery previously not available or machinery of new types for agriculture, mining and the construction and processing industries.
3. In addition to its activities related to investments in new plants and the expansion of existing ones, the joint project issued a number of publications on capital goods which were distributed even in foreign countries and defined demand, the potential growth situation and defects to be corrected in subsectors of capital goods and in major sectors requiring such goods. The joint project publications were as follows:
- 1. MEXICO: Una Estrategia para Desarrollar la Industria de Bienes de Capital;
 - 2. La Oferta Nacional de Bienes de Capital (English and Spanish versions);
 - 3. La Producción de Compresores en México;
 - 4. La Fundición en México;
 - 5. La Industria Electrónica Profesional en México;
 - 6. La Demanda de Bienes de Capital para las Industrias Petrolera y Petroquímica Básica en México;
 - 7. La Demanda de Bienes de Capital para la Generación y Distribución de Electricidad en México;
 - 8. La Demanda de Bienes de Capital para las Industrias de Papel y la Celulosa en México;
 - 9. La Demanda de Bienes de Capital para la Minería en México;
 - 10. MEXICO: La Pailería en 1984;
 - 11. Política Industrial y Desarrollo en Corea del Sur;
 - 12. MEXICO: Los Bienes de Capital en la Situación Económica Presente;
 - 13. Memoria del Seminario de Alto Nivel sobre la Industria de Bienes de Capital;
 - 14. Efectos del Origen de la Ingeniería en el Desarrollo de la Industria de Bienes de Capital.
4. A number of studies were not published at the time since Nacional Financiera did not consider their distribution to be relevant. However, these studies were completed under the joint project and are being held ready for publication in NAFIN, although in some cases it would be necessary to update them because conditions, especially economic conditions, have changed since they were completed.
5. In 1977, Nacional Financiera established an Information Centre on Capital Goods, which was initially intended for internal consultation on the subject by the staff of the institution. This Centre was set up at the suggestion and with the support of the joint project working group and is at the moment being expanded and strengthened to serve both NAFIN personnel and the public and industry in general.

B. Defects:

1. In the long period from 1971 to the present, the joint NAFIN/UNIDO capital goods project has also had to overcome a number of difficulties and has undoubtedly suffered from certain defects. We have repeatedly mentioned the priority that was given to it from the very beginning both by Nacional Financiera, the United Nations Development Programme and the United Nations Industrial Development Organization. However, not all of the objectives in its three phases were satisfactorily attained, basically owing to defects in the sphere of human resources, since in some cases the experts recruited had not the technical capacity and above all the aptitude to interpret and understand the Mexican industrial and political scene. Although the problems that this caused did not decisively affect the positive results of the project, they did indeed obstruct the implementation of some of the activities planned.
2. Some activities could not be completed or had to be cancelled owing to defects in co-ordination and the slowness of bureaucratic procedures, since not only the project management but also the counterpart, the Mexican Government, through the Ministry of Foreign Affairs, as well as the local UNDP office, UNIDO and finally Headquarters in Vienna were involved in administrative decisions regarding the project.

The difficulty of obtaining rapid replies from all those involved in decisions, especially administrative decisions, caused delays and for example in some cases the loss of experts, who took on other work if they were not recruited in good time, so that they were not available when their recruitment was authorized.

3. The statistical information that was used from the beginning of the project was not always brought up to date and there is still no permanent follow-up system for providing reliable data on the situation with regard to the various types of capital goods and related consumer sectors.
4. From Phase I onwards, a number of measures to be introduced in industry were identified, with reference to quality control, production and management systems, etc.; they were intended to improve efficiency and make possible the manufacture of products that would be internationally competitive in quality and price. The project had strong repercussions, as was indicated above, in the establishment of policies, a strategy, methodology and general approaches for the development of the capital goods industry as a whole, but did not have great influence at the enterprise level. This was not the objective of the project work, but, in the present economic situation, as a result of which the industry is passing through a critical phase, it is becoming clear what approaches identified by the NAFIN/UNIDO team more than ten years ago it has not been possible to implement; consequently, in other future activities, it will be necessary to stress this type of solution, going right down to the production level in each enterprise.
5. Some of the projects that materialized in the phase of Mexican economic growth did not come to full maturity; some official circles even consider that the negotiations, the technological partner and even the technology decided upon were not the most appropriate. That might certainly be true in some respects, although it is necessary to consider the economic and political context at the time in which the projects materialized, when the crisis that later affected the country could not yet be visualized. Therefore, if there are defects in the

projects, it will not be possible to evaluate them and determine the viability of each project until a later date, when the plants installed recover or reach a level of capacity utilization that is at least close to that for which they were designed. It should also be remembered that the joint project group participated in negotiations on and the implementation of each project in an advisory capacity and that the final decisions were taken by the investors, both foreign and national, private and quasi-governmental.

PROSPECTS

The Joint NAFIN/UNIDO Capital Goods Project has reached what can be considered as the final stage of work comprising studies of capital goods, both in their comprehensive aspects and with regard to the various subsectors or groups of equipment that make up part of the complex required by industry and the economy in general. Since the methodology has been established and has been tested for the promotion and development of industrial projects, all incorporated in the framework of a macro-economic strategy, the project can be regarded as concluded in these respects. If new joint projects are carried out between UNIDO and Nacional Financiera, an effort should be made to carry out concrete activities in specific industries.

As was seen in the section analysing the project outputs during the 15 years of its three phases and in the light of the present economic situation - incidentally the prospects are that it will probably last longer than would be desirable - it would be necessary to consolidate the results achieved with regard to investments and projects within the capital goods industry; since the policy of the Mexican Government is to restructure the industrial sector, concrete activities will have to be carried out in that direction.

Among the defects that emerged in the implementation of the project it was mentioned that statistics were not systematized in such a manner that they could be continuously updated; accordingly, one of the prospects for new activities between NAFIN and UNIDO will also be the task of consolidating the information systems so that the studies previously carried out by the project in previous phases do not lose their validity.

In the context of the policies that the Mexican Government has defined for the restructuring and consolidation of the industrial sector, it will be necessary to define concretely the fields in which Mexico will wish to consolidate and master technologies for the manufacture of capital goods; in those fields efforts should be focused on achieving concrete results according to these new guidelines and work should not be done on general aspects.

As was mentioned, many of the capital goods enterprises display technological, production and management defects, as a result of which they are working at low levels of efficiency and produce equipment that is not internationally competitive, either in quality or price. For that very reason, and in the context of the new industrial restructuring policies, it will be necessary to enlist the assistance of experts to collaborate with selected industrial plants and help them to consolidate their production capacity and reorient the manufacture of equipment towards fields that are defined as strategic.

Recently, Nacional Financiera announced its interest in supporting the development of the professional electronics industry in Mexico and set up a specific unit to work on the promotion, establishment and consolidation of industrial plants in that subsector. This possibility opens up horizons for new joint activities between UNIDO and NAFIN, which could bear fruit in the form of significant advances within the Mexican capital goods industry.

The development of a design capacity in Mexico, both by specialized enterprises and within plants manufacturing capital goods, is another area that requires priority attention, since, as was seen in the retrospective account of the project, this is one of the major deficiencies within the industrial sector and especially within the capital goods industry that has made it vulnerable and dependent on foreign technology and manufacturers. For this reason, Nacional Financiera, in its capacity as an industrial development bank, can make a significant contribution to consolidating the Mexican capital goods industry, by supporting activities by which the design capacity that is lacking in Mexico

can be created; this design capacity can and should be developed from an educational base, that is to say, with the participation of the institutions for higher education, technological development and research.

As can be seen, there are still extremely broad prospects for joint activities between Nacional Financiera and UNIDO in the capital goods field, so that one can foresee a number of activities that could be carried out over a long period, if the will exists to continue collaboration between the two bodies, and if the necessary funds are available.